

INVENTORY OF RESEARCH PROJECTS 1973-74

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Ministry of the
Environment

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PREFACE

Many people willingly contributed time and effort to the production of this report which was prepared by Ms. Marilyn Jackson. Any queries arising out of its contents should be directed to Dr. Peter Victor of the Environmental Approval Branch.

INVENTORY OF RESEARCH PROJECTS

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INTRODUCTION AND SUMMARY

In June 1973, the Strategic Planning Branch commenced the preparation of this inventory of the research being conducted by this Ministry. The idea for the project stemmed from a request from the Health Research Committee of the Ministry of Health for a list of the current research projects of this Ministry relating to environmental health. The information was to be used by the Health Research Committee in the course of setting its own research priorities. That request highlighted a general need, recognised by the Deputy Minister, to make such information readily available to all agencies engaged in environmental research both within and outside the Ontario Government.

The purpose of this report, then is to promote the communication of this Ministry's activities to the research community, and to facilitate a more efficient use of capital and human resources devoted to environmental

research. It is hoped that the information contained here will assist those currently conducting studies, by providing them with access to projects in this Ministry which are related to their own. Another major objective is to foster co-operative efforts and prevent the duplication of programs, particularly among Ministries of the Ontario Government. Ultimately, the inventory and successive updates will provide a comprehensive background for the selection of environmental research priorities, revealing those areas which are already being extensively examined, and those which demand increased attention.

The report consists of profiles of all the individual research projects being conducted by each Branch of the Ministry in the 1973-74 fiscal year, as they were identified by the Branches themselves. It includes in-house activity, as well as grants to Universities and contract research.

Since a dictionary definition of research - "investigation aimed at the discovery of facts or principles" - is so general as to include some element of almost every operation of this Ministry, certain limits were established to the terms of reference of this report. The inventory includes:

- (1) all projects conducted outside the Ministry, through Ministry of the Environment funding;
- (2) all projects of the Research and Laboratory Branches
- (3) any in-house activity which involves fundamental research;
- (4) major regional studies, pilot programs, and experimentation with new technological or administrative approaches to established operations.

It is outside the objectives of the inventory to include the routine test series and studies which implement on-going management programs. To distinguish those in-house projects with a significant innovative element is often difficult; however, for the purposes of this report the decisive

factor is that the Branch conducting a project considers it to constitute part of its research activity.

The statistical tables found at the end of this Introduction are drawn directly from the information presented in the profiles. Figures are broken down by Branch, and aggregated to reflect the Ministry activity as a whole. Where separate projects are grouped as a set in the report, but distinct budgets and durations are supplied, each component is identified separately in the computations. Budgets and durations are tabulated as the information was received; however, because of the absence in the Ministry of any standard system of identifying and accounting for resources devoted to research, statistics derived from these profiles can only claim to demonstrate the general direction and contours of the program.

Table 1 gives the total number of research projects reported for each Branch. This total is broken down to demonstrate the way in which each Branch employs the funds it allocates to research. Approximately 75% of the projects are conducted in-house; the majority of those remaining are grants to Universities. There is, however, a wide disparity among the Branches; only three utilize contract or research grant programs to any but a minimal extent.

The volume entitled "Public Response Factor" is included to point out the number of projects which explicitly study the public reaction to the experimental program in question. These represent a little over 1% of the total. Table 1 also indicates that, overall, about 10% of the projects involve some co-operation with other Ontario Ministries, Federal Government Agencies, municipalities, etc. In some cases the effort is a joint undertaking throughout; in others, the co-operating agency contributed samples, or facilities, to a Ministry of the Environment project.

Thirty percent of the projects are expected to last for a period less than one year and 24% have an expected duration of one to three years. Thirty-seven percent are either open-ended or are of uncertain duration. Only 9% of the projects extend over a period greater than three years. This pattern is reasonably typical of all Branches.

Table 3 reflects the research budgets of the various Branches in 1973/74, and shows whether funds are concentrated on a few major projects, or divided among many smaller ones. In some cases, the project necessitated purchase of capital equipment; this expenditure is included in determining the project value. Where projects were valued in terms of man-months, a conversion factor of \$1,250 per man-month was applied. The totals represent the sum of dollar figure budgets and those converted from valuations in man-months. Thirty-eight percent of the budgets were not ascertained; this fact influences the significance of conclusions drawn from the aggregate figures. If, however, the unascertained projects are consistent with those which are valued, about

50% require \$10,000 or less, another 20% from \$10,000 to \$20,000, and of those remaining, 10% exceed \$50,000 in budget.

FORMAT

Projects are grouped under their funding Branches; according to the Ministry structure prior to re-organization. The Branches are presented in the same order as they appear in the Management Reporting publication "Work Program, 1972-73". The profiles supply the following information:

<u>Objective</u>	Immediate reasons for embarking on the project; often includes, implicitly or expressly, indications of how these immediate objects contribute to long-term policy intention.
<u>Description</u>	Details of the projects - its phases, focuses, the methodology employed - expressed so as to indicate the exact nature of the research to persons with expertise in the field. Where a set of projects has been grouped under one title, the individual projects receive separate treatment under the "Description" heading, and thereafter.
<u>Duration</u>	Usually starting date and actual or projected completion date. When only a fiscal year period is indicated, the duration is uncertain, but is less than a year; and the project was begun and completed within that fiscal year. Where a project has several phases, their durations are presented separately.

<u>Site</u>	Particular location of experimental activity, if specified.
<u>Commentary</u>	<p>How the research is performed and funded. If in-house, by what Branch? With co-operation from any other agency? Is it a component of some larger study?</p> <p>If by contract or grant, identification of the firm, or University (and principal investigator) receiving the funds. Derivation of funds, drawn from the Management Reporting "Work Program, 1972/73" - indicates the specific program, sub-program and activity through which funds flow for this project. If there are special funding mechanisms (for instance, the Canada-Ontario Agreement on the Lower Lakes), they are noted.</p>
<u>Budget</u>	<p>An estimate, either in terms of time expended, or dollar figures, of the cost of the project for 1973/74. If the project extended beyond the current fiscal year, it is indicated whether the figure represents total project value, or the portion spent in 1973/74. In some cases, expenditure in previous years is supplied. The figures are not precise, except where they represent a grant or contract disbursement. They are intended to indicate the relative magnitude of the project.</p>
<u>Report</u>	Whether there will be interim and/or final reports available; and when anticipated
<u>Supervision</u>	The contact person in the Branch, from whom further details may be obtained.

In some instances, not all this information was available. In particular, budget allotments for in-house activities were difficult to isolate.

The report is constructed so as to be capable of periodic update by removal and insertion of pages.

TABLE 1 Branch	TOTAL NUMBER OF PROJECTS	HOW RESEARCH FUNDS EMPLOYED				PUBLIC RESPONSE FACTOR	xxii COOPERATION OUTSIDE M.O.E.
		In-House	Grant to University	Contract	Other		
STRATEGIC PLANNING	3	3					2
WATER QUANTITY	5	5					1
WATER QUALITY	31	29	1	1		2	9
PRIVATE WASTE AND WATER	6	5		1			
AIR MANAGEMENT	26	6	20				
WASTE MANAGEMENT	14	5	4	3	2 (SWEEP)	1	4
PESTICIDES CONTROL	18	5	13				4
RESEARCH	44	41		3			4
LABORATORY	76	76					1
TOTAL	223	175	38	8	2	3	25

TABLE 2
DURATION

Branch	6 months and under	Over 6 months to 1 year	Over 1 year to 3 years	Over 3 years to 5 years	Over 5 years	Open-ended	xxiii Uncertain
STRATEGIC PLANNING	1	2					
WATER QUANTITY			2			3	
WATER QUALITY	5	11	8	3		4	
PRIVATE WASTE AND WATER			2			3	1
AIR MANAGEMENT		9	9	5	1		2
WASTE MANAGEMENT	4	1	2	2		3	2
PESTICIDES CONTROL		6	2	1	1	3	5
RESEARCH		6	17	5	1	11	4
LABORATORY	12	10	12	1		9	32
<u>TOTAL</u>	22	45	54	17	3	36	46

TABLE 3

*BUDGET 1973/74	\$10,000 and under	Over \$10,000 to \$20,000	Over \$20,000 to \$30,000	Over \$30,000 to \$50,000	Over \$50,000 to \$100,000	Over \$100,000 to \$200,000	Over \$200,000	Not Ascertained	TOTAL / SCERTAINED
Branch									
STRATEGIC PLANNING	2	1							\$ 40,500
WATER QUANTITY				2		2		1	\$382,200
WATER QUALITY	9	6	2	6	3	2		3	\$951,875
PRIVATE WASTE AND WATER	2	1	2	1					\$200,000
AIR MANAGEMENT	14	9	2	1					\$256,604
WASTE MANAGEMENT	6	3	1		2	1	1		\$2,983,100

* Conversion factor for projects valued in man-months: 1 man-month = \$1,250

BUDGET 1973/74 cont'd	Branch	\$10,000 and under	Over \$10,000 to \$20,000	Over \$20,000 to \$30,000	Over \$30,000 to \$50,000	Over \$50,000 to \$100,000	Over \$100,000 to \$200,000	Over \$200,000	Not Ascertained	TOTAL ASCERTAINED
	PESTICIDES CONTROL	12	1						5	\$82,595
	RESEARCH	22	5	6	5	3	1		2	*\$6,913,810
	LABORATORY		2	1					73	Not Ascertained
	<u>TOTAL</u>	67	28	14	15	8	6	1	84	** \$11,810,684

* \$607,800 of this amount represents 16 projects funded through the
Canada - Ontario Agreement on the Lower Lakes
50% from Provincial Treasury, 50% from Federal government

** Does not include Laboratory Branch

Strategic Planning Branch

ALTERNATIVE POLICIES FOR POLLUTION ABATEMENT IN THE ONTARIO PULP AND PAPER INDUSTRY

Objective To assess alternative policies for pollution abatement in the Ontario pulp and paper industry.

Description Define and quantify the consequences of alternative pollution abatement policies for the pulp and paper industry in Ontario. Examine the effects of different environmental objectives on these consequences.

Duration Commenced October, 1973; 6 - month duration.

Commentary An in-house project of the Strategic Planning Branch, with the cooperation of the Industrial Wastes, Water Quality and Sanitary Engineering Branches of the Ministry of the Environment, and of the Ministries of Treasury, Economics and Intergovernmental Affairs, and Industry and Tourism. Consultation is expected with the Ministry of Natural Resources. (Specific Budgetary Program - Administration: Strategic Planning)

Budget One Economist 4, 75% of time.

Report Interim proposal-progress report for internal use;
final report to be prepared when project completed.

Supervision Dr. J. Donnan, Economist

AN ECONOMIC AND ENVIRONMENTAL MODEL FOR PLANNING AND FORECASTING

Objective To establish an empirical model to forecast medium and long-term environmental problems, and to facilitate the analysis of policies which are intended to deal with them.

Description In conjunction with the Econometrics Branch at T.E.I.G.A., the existing input-output model for Ontario will be adapted to account for inputs from the environment to the economy, and outputs from the economy to the environment. Forecasts of provincial economic growth will be used to generate forecasts of the environmental inputs and outputs associated with the growth. The effects of these future environmental inputs and outputs on the air, land, and water quality of the province will then be capable of analysis and evaluation.

Duration Pilot stage - Sept. 1973 to April 1974
Second stage - April 1974 to September 1975

Commentary An in-house project of the Strategic Planning Branch, facilitated by consultation with the Ministry of Treasury, Economics and Intergovernmental Affairs. (Specific Budgetary Program - Administration: Strategic Planning)

Budget Pilot stage - one student, 75% of time; economist 4, 25% of time. Second stage - not yet ascertained.

Report Preliminary written report - April 1974; second stage report - September, 1975

Supervision Dr. P.A. Victor, Economist

ENVIRONMENTAL RESEARCH INVENTORY

Objective To compile an inventory of environmental research projects of the Ministry of the Environment, for general information purposes, as well as to provide data for internal program assessment.

Description Each Branch submitted the details of projects which it considered to fall into the category of "research". A format was chosen to convey the information concisely, and to be easily updated. Material was organized both according to Branch undertaking the project, and subject matter of the research. The inventory includes both in-house and grant or contract research.

Duration June 1973 to January, 1974

Commentary An in-house project of the Strategic Planning Branch, conducted partially to provide information requested by the Health Research Committee, Ontario Ministry of Health. (Specific Budgetary Program - Administration: Strategic Planning)

Budget \$2750

Report Available updated to Aug. 1973

Supervision Dr. P.A. Victor, Economist

Water Quantity Branch

ASSESSMENT OF GROUND WATER INFLOW TO LAKE ONTARIO

Objective To contribute hydrogeological information on the terrestrial balance component of the International Field Year for the Great Lakes program (IFYGL) (other aspects were "lake balance" and "energy balance")

Description Utilizing data obtained from hydrogeologic studies of seven representative areas in the Lake Ontario water basin, the program assessed the total ground water inflow from the Province of Ontario, to Lake Ontario.

Duration April 1972 to April 1973 (data Collection); to 1974 - Interpretation of data.

Commentary An in-house research project by the Water Quantity Branch (Specific Budgetary Program-Water Management: Water Quantity; River Basin Research)

Budget \$43,100 (total program value)

Report To be published in component form by Branch within 18 months (approximately). Full IFYGL report later. Now completed:

- (1) Bedrock well yield map
- (2) Overburden well yields map
- (3) Hydrogeology of the 40 Mile Creek Drainage Basin

Supervision R. C. Hore, Supervisor

GEOPHYSICAL STUDIES AND MODELLING

Objective To improve techniques for resource assessment, and to enhance the capacity of models to predict the economic and physical repercussions of factor variation.

Description The modelling process employs variations of basic standard procedures to produce and/or interpret data from related information - geologic, hydrologic, physiographic, land use.

Duration Open-ended

Commentary An in-house research project by the Water Quantity Branch (Specific Budgetary Program-Water Management: Water Quantity; River Basin Research)

Budget \$39,100 (1972/73) Only a small proportion is actually devoted to the research aspects of the program.

Report No formal report, although some components completed as work units for other studies.

Supervisor R. C. Hore, Supervisor

GRAND RIVER RECHARGE STUDY

Objective To complete a feasibility study of the ground water recharge process as an alternative to conventional water purification techniques to provide a municipal water supply from a surface water source.

Description The study will assess the recharge technique in both its physical and economic aspects.

Duration Commenced 1972; definite commitment to 1973/74.

Commentary An in-house research project by the Water Quantity Branch (Specific Budgetary Program-Water-Management: Water Quantity; Surveys and Projects)

Budget \$150,000

Reports Interim consultants' report complete, for internal use; further internal consultants' report to be completed 1973, for limited distribution to the Regional Municipality.

Supervision T. J. Yakutchik, Supervisor

GROUND WATER POLLUTION STUDIES

Objective To improve expertise in predicting the migration of ground water contaminants, as a supplement to consultative activities involving Sanitary Engineering, Industrial Wastes and Waste Management Branches.

Description Currently in primary developmental stage; will involve monitoring chemical contaminants primarily.

Duration Open-ended

Commentary An in-house research project by the Water Quantity Branch (Specific Budgetary Program-Water Management: Water Quantity; River Basin Research)

Reports None as yet

Supervision T. J. Yakutchik, Supervisor

Water Quality Branch

REPRESENTATIVE BASIN STUDIES

Objective To identify hydrologic relationships in five typical areas of Southern Ontario, facilitating the formulation of a predictive model for each basin type.

Description In five basins representative of major physiographic and geomorphologic regions, extensive ground water sampling and chemical analyses were done. Extent and characteristics of subsurface aquifers were assessed. Relationships drawn between data collected and land uses. In selected basins studies also focused on meteorologic data, and soil moisture and snow surveys

Duration Commenced 1965; open-ended

Commentary An in-house research project by the Water Quality Branch. Study dovetails with the International Hydrological Decade Program. (Specific Budgetary Program-Water Management: Water Quantity; River Basin Research)

Budget \$150,000 (approximate) for 1973/74 (includes the cost of data collection as well as interpretation).

Report To be issued

Supervision R. C. Hore, Supervisor

CHLOROPHYLL-SECCHI DISC SELF-HELP PROGRAMME, RECREATIONAL LAKES

Objective To evaluate over a long term (several years) the status of enrichment as indicated by measurements of suspended algae and water clarity in recreational lakes in the province.

Description Programme involves extensive co-operation and communication with concerned members of cottagers associations, permanent lake-side residents and provincial government agencies who agree to collect water samples for chlorophyll a analysis and measure water clarity at regular intervals throughout the summer.

Duration May - November, annually; program commenced 1971.

Commentary An in-house project of the Water Quality Branch with the co-operation of the Laboratory (Specific Budgetary Program - Water Management: Water Quality; Biology).

Report 1973 reports by 1974

Budget 4 man-months/ annum

Supervision G. Robinson

DEVELOPMENT OF A WATER QUALITY GUIDELINE FOR SULPHATE

Objective To establish a maximum acceptable concentration for sulphate which will assure the maintenance of a healthy aquatic fauna - particularly in soft pre-Cambrian waters subject to high sulphate loadings from mining and milling operation.

Description Investigation of the chronic effects of high sulphate concentrations (250-4000 mg/l) on fish and invertebrate organisms. Both field and laboratory studies are involved. Organisms studied include rainbow trout, smallmouth bass; both littoral and burrowing mayfly nymphs; amphipods and cladocerans; clams. Responses study - lethality to invertebrates; lethality, growth, O₂ uptake and hematocrits for fish.

Duration June 1972 to June 1974

Commentary An in-house project of the Water Quality Branch at the request of Industrial Wastes, and with the co-operation of the Laboratory Branch (Specific Budgetary Program - Water Management: Water Quality; Biology).

Budget Approximately 20 man-months

Report Expected fall 1974; technical report

GREAT LAKES STUDIES, WITH EMPHASIS ON THE TORONTO AREA SHORELINE

Objective To focus on particular facets of interaction between the Toronto urban centre and the waters of Lake Ontario.

Description (1) Study of persistent substances (polychlorinated biphenyls - PCB's) and heavy metals in fish caught in the Great Lakes, particularly Lake Ontario
(2) Study of the processes by which the waters of Toronto Harbour are exchanged with the waters of Lake Ontario, and the movement of pollution between lake and harbour.

(3) The movement of water and pollutants in the nearshore area off the Eastern Beaches of Toronto.

(4) Study of heavy metal distribution in sediments and water in the Toronto area of Lake Ontario.

(5) Bottom fauna in the Toronto area of Lake Ontario.

(6) Extension of the above studies into the winter season.

Duration One year (1973/74)

Commentary A research grant to the University of Toronto, Institute of Environmental Sciences and Engineering, Great Lakes Division, funded by the Water Quality Branch. (Specific Budgetary Program - Water Management: Water Quality; Biology Section).

Budget \$100,000

Supervision C.F. Schenk, Chief, Biology Section

HAMILTON HARBOUR MODELLING STUDY

Objective Develop a predictive water quality model which will consider changes in shoreline geometry and discharges

Description Detailed water quality surveys of the harbour including bottom sediments, operation of recording chemistry and current meters to determine mass exchange in Burlington canal and time variations in the harbour. Developing computer numerical models, process and statistical models.

Duration 1972 - 1974

Commentary An in-house project of the Water Quality Branch with the co-operation of the Ministry of Natural Resources, Municipal Labs Hamilton and Canada Centre for Inland Waters (Specific Budgetary Program- Water Management: Water Quality; Water Quality Surveys).

Budget 36 man-months

Report Interim 1973; final 1974

Supervision M. D. Palmer

INFORMATION SEARCH - EFFECTS OF RECREATIONAL LAND USE ON LAKE WATER QUALITY

Objective To document effects of recreational land use on water quality within the Great Lakes and determine the "State of the Art" with respect to present management and legislation.

Description The project is a literature research function the main thrust of which is to outline the water quality implication of cottage and parkland development with respect to nutrient enrichment, bacterial contamination and solid waste disposal problems.

Duration July to November, 1973

Commentary An in-house project of the Water Quality Branch at the request of the Great Lakes Water Quality Board. A certain amount of liaison with other Government agencies will be necessary for a proper and complete evaluation of the existing situation. (Specific Budgetary Program - Water Management: Water Quality; Biology).

Budget 4 man-months

Report Report completion date: November, 1973, detailed report

Supervision K. H. Nicholls

KAWARTHA LAKES MANAGEMENT STUDY: LAKE ENHANCEMENT

Objective Investigation and implementation of techniques for enhancing recreational lakes which have deteriorated because of excessive aquatic enrichment; development of sound water and fish management plans.

Description A set of projects including:

- (a) Air-induced destratification of water (Projects #86(a) and (b))
- (b) Chemical precipitation of contaminants (Projects #88, 89)
- (c) "Operation Weed Removal" - mechanical harvesting of weeds, assessment of impact of the removal on the fisheries, plant populations, and water quality of Chemong Lake. (Project #82)
- (d) Investigation of remote sensing techniques for establishing, mapping, and speciating standing crops of aquatic vegetation, by color and infrared aerial photography, (Project #83)
- (e) Documentation of restoration effects on lakes, of phosphorus removal in sewage treatment process. (Project # 83)

Duration Overall study period is 1971 to 1975; for duration of specific component projects, see "1973-74 Field Project Summary Sheets, Water Quality Branch"

Commentary "Operation Weed Removal" is a joint M.O.E.-M.N.R. program; the other components are in-house projects of the Water Quality Branch, with some assistance from the C.C.I.W., and C.C.R.S. (Specific Budgetary Program - Water Management: Water Quality; Biology Section)

Budget (a) 27 man-months total; (b) 16 man-months total;
(c) 32 man-months in 1972/73, \$160,000 data processing contract;
(e) 10 man-months

Reports (a) Final report, 1975; (b) Interim, 1973/74; (c) Final report after 1975; (d) 1974; (e) 1974/75

Supervision I.Wile, M.Michalski, K.Nicholls, M.Palmer

MERCURY PROGRAM

Objective To maintain surveillance on, and expand information about, the distribution and movement of mercury in waters, sediments, and biota in the (a) St. Clair, and (b) English River systems (separate projects).

Description (a) Regular sampling of water and sediments in both St. Clair River, and Lake St. Clair; mercury and methyl mercury presence determined in food chain organisms; degree of contamination in sport and commercial fish assessed (Project #59, #73)
(b) Sediment sampling, and study of transportation through resuspension.

Duration (a) May - October, 1973; (b) August 1973, Spring, 1974.

Commentary A set on in-house projects of the Water Quality Branch, supported by the Laboratory Branch, and with the cooperation of the Ministry of Natural Resources in fish sampling. (Specific Budgetary Program - Water Management: Water Quality; Surveys and Biology Sections).

Budget (a) 27 man-months total; (b) 1½ man-months

Report (a) Monitoring reports twice yearly; report on fish contamination ,
January 1974; (b) Report by memo (internal).

Supervision (a) O. Moore, G. Myslik; (b) S. Irwin.

MUSKOKA LAKES STUDY

Objective To assess occurrence and relative severity of water quality problems throughout this recreational lakes region.

Description Three phases: (a) a survey questionnaire to identify observations and primary concerns of lake residents and cottagers;
(b) a study of effects of DDT on fish populations with continuing sampling of fish, clams and sediments to ascertain the rate of decline of DDT levels, and the restoration of capacity to reproduce, and to be consumed safely.
(c) examination of aquatic enrichment effects.

Duration Commenced 1970; monitoring to continue indefinitely.

Commentary An in-house research project of the Water Quality Branch in cooperation with the Laboratory Branch, and with the support of the Ministry of Natural Resources. (Specific Budgetary Program - Water Management: Water Quality; Biology Section)

Budget Three staff members, full time, per annum

Report of DDT. Completed on phases (a) and (c); annual technical reports on decline

Supervision R. G. Boelens, Biologist

RECREATIONAL LAKES NUTRIENT BUDGETS

Objective To estimate contribution of nutrients to four Precambrian Lakes in runoff from forested land, marsh drainage and cottage waste disposal systems and to evaluate the relative importance of each major contribution. Other minor seasonal sources and sinks are being evaluated. It is expected that artificial nutrient sources will be eliminated in 1974-1975 and effects above assessed.

Description Gauging of inflowing and outflowing streams, regular water quality monitoring. Measurements of primary production, nutrient regeneration and particulate sedimentation, employing specialized equipment.

Duration May 1973 to December 1974 Site Harp Lake, Gerry Lake (Huntsville area); McLean Lake (Severn system); Riley Lake

Commentary An in-house research project of the Water Quality Branch. (Specific Budgetary Program - Water Management: Water Quality; Biology Section).

Budget 15 man-months

Report September 1975

Supervision K. H. Nicholls

ST. CLAIR RIVER PLUME STUDY

Objective To develop a mathematical relationship for the dilution of a conservative input from a shoreline discharge.

Description The input source for the study consists of two Dow Chemical Company outfalls which contribute more than 90% of the chloride load to the river. Existing data from range monitoring programs and additional sampling of the outfalls and the area immediately downstream will be used to trace the chloride concentration both downstream and out from shore.

Duration May to November 1973

Commentary An in-house project of the Water Quality Branch at the request of Industrial Wastes (Specific Budgetary Program - Water Management: Water Quality; Water Quality Surveys).

Budget 3 man-months

Report Memorandum of November 30, 1973

Supervision J. D. Kinkead

SUDBURY PROGRAM - WATER QUALITY

Objective To develop, through a set of research projects, a comprehensive analysis of the environmental conditions existing in the Sudbury region, and experiment with remedial techniques.

Description (a) Intensive monitoring of primary productivity and standing crops, primary and secondary trophic levels.
(b) Extensive monitoring - methodology development.
(c) Sulphate standards development.
(d) Toxicity evaluations for fish.
(e) Lake reclamation by addition of buffering agents to combat acidity.

Duration Commenced 1973/74; 3 to 4 year span in all.

Commentary An in-house research project of the Water Quality Branch. The study, designed by the Sudbury Environmental Task Force, involves coordinated efforts of the Air Quality Branch, other related branches of the M.O.E., and the Ministry of Natural Resources. (Specific Budgetary Program - Water Management: Water Quality; Biology and Surveys Sections)

Budget 36 man-months to September, 1973

Report Detailed, and interim reports completed for 1973/74; final report expected in 1975/76.

Supervision Nels Conroy, B. Fallis.

TOXICITY STUDIES IN FISH

Objective The four separate projects are directed toward improving methodology for measuring toxic effects on fish, and determining responses to particular substances.

Description (a) Development of laboratory capacity to detect sub-lethal toxicant activity by monitoring fish respiration electronically (Project #75)
(b) To culture four bioassay test species of fish, for egg-to-egg or partial life-cycle toxicity testing. (Project #77)
(c) To determine significance of ammonia from refinery effluents in producing acute toxicity in fish (Project # 71)
(d) Application and evaluation of seven broad-spectrum antibiotics on five species of teleostean fish commonly used in bioassays. (Project # 79)

Duration (a) March - December, 1973; (b) 1973 - 1975 (2 years); (c) June - October, 1973; (d) 1973 - 1974.

Commentary In-house projects of the Water Quality Branch, generated either internally or by Industrial Wastes (Specific Budgetary Program - Water Management: Water Quality; Biology Section - Toxicity & Pesticides)

Budget Regular staff, 50 man-months total

Report (a) Feb. 1974; (b) 1975; (c) Spring, 1974; (d) Fall, 1974

Supervision R. Boelens, C. Inniss, D.L. Wells

UPPER LAKES REFERENCE (IJC)

Objective A group of projects aimed at assessing present water quality in the Upper Great Lakes, and establishing baselines for assessing the effects of various pollutant emissions and water uses on phytoplankton and fish communities. The study will examine trans-boundary movement of pollutants, and the effects of various industrial and municipal discharges on water quality.

Description (a) Determination of trans-boundary movement of pollutants in the St. Mary's River (Project # 63)
(b) Near shore water quality monitoring; establishment of baseline for measuring effects of further shoreline development (Project #64)
(c) Phytoplankton monitoring; to determine current abundance, diversity and adaptability of communities (Project #65)
(d) Peninsula Harbour Study; sampling over a grid for mercury and organic content of sediments. Special attention to effluent plume from the adjacent pulp and paper mill (Project #66)
(e) Jackfish Bay Study; effects of pulp and paper mill discharge (Project # 67)
(f) Block Bay study; sampling of water, sediments and benthic communities at various depths to determine baseline characteristics for an undeveloped bay (Project #68)
(g) Thunder Bay Study; comprehensive examination of quality factors (Project #69)
(h) Near Shore Fisheries assessment; establishment of baseline data on presence of contaminants, esp. mercury, PCB's, DDT, dieldrin, in four species of fish (Project #101)

Duration Most projects to be completed by end of 1974; for particulars, see "1973-74 Field Project Summary Sheets, Water Quality Branch"

Commentary An in-house program of the Water Quality Branch, contributing along with other IJC authorities toward the overall study. (Specific Budgetary Program - Water Management: Water Quality; Biology & Surveys Sections)

Report File reports for most projects; all reports to be included in final Upper Lakes Reference to be issued by IJC.

WATER QUALITY MODELS - GREAT LAKES

Objective To define processes in the near shore lake regions like eutrophication and sedimentation and some lakewide models, for Lakes Superior and Ontario.

Duration On-going

Commentary An in-house project of the Water Quality Branch (Specific Budgetary Program - Water Management: Water Quality; Surveys).

Budget 6 man-months

Report Annual, and project

Supervision M. D. Palmer

WATER QUALITY MODELS - RIVER BASINS

Objective Development of a simulation model for the factors such as nutrients, waste disposal, precipitation, and biomass production in the system, in order to produce management guidelines ensuring availability of adequate quantities of water, of suitable quality, to meet demands; and to provide flood and erosion control.

Description Data is currently being collected for the Thames River Basin. Components of study:

(a) General surveys of chemical and physical data through London and 40 miles downstream, with additional focus on effects of chlorination of sewage on water quality, oxygen demand of treated sewage, and storm drainage effluent.

(b) Formulation of a flood control reservoir management approach.

(c) Attempts to develop new techniques in estimating standing crops, sedimentation, primary production and nutrient loadings in stream systems.

Duration Monitoring commenced 1970; ongoing to 1975 at minimum. See "1973-74 Field Projects Summary Sheets , Water Quality Branch" for more particular information.

Commentary A set of in-house research projects of the Water Quality Branch, with the cooperation of Sanitary Engineering, U.T.R.C.A., and the Ministries of Natural Resources, and Agriculture and Foods, on certain phases of the study. (Specific Budgetary Program - Water Management: Water Quality; Surveys Section)

Budget 96 man-months in all

Report (a) Detailed basin report, Dec. 1973; (b) Dec., 1973; (c) Winter, 1973/74

Supervision V.E. Niemela, S. Thornley, D. Osmond, S.L.Wong

Private Waste And Water Quality Branch

EVALUATION AND ASSESSMENT OF SMALL AEROBIC SEWAGE DISPOSAL SYSTEMS

Objective To evaluate newly-developed systems as presented by the manufacturers.

Description Package sewage treatment units are being tested under supervision of Technical Services for about 12 months in order to evaluate efficiency of operation, quality of the effluent, servicing requirements for recommending or approving the system for installation in the Province.

Duration Open-ended

Commentary An In-House research project of the Private Waste and Water Management Branch. (Specific budgetary program- Water Management: Private Waste and Water; Technical Services).

Budget \$5,000 per annum

Report Interim report; access by consent of manufacturer

Supervision N.D. Pappas, Supervisor, Technical Services, N.A. Chowdhry, P. Eng.
Sr. Development Engineer

FEASIBILITY STUDY OF HOLDING TANKS AND SEWAGE HAULAGE SYSTEM FOR INDIVIDUAL PREMISES

Objective Investigation into the feasibility of a sewage holding tank and haulage system to service individual premises.

Description Existing and additional information collected from the Provincial agencies, equipment suppliers and from haulage contractors on the subject. Having defined the problem and the design criteria and the knowledge of equipment available alternative solutions have been proposed.

Duration Commenced 1972; the first phase of the study is complete. In 1974, it is proposed that the findings be applied at particular sites.

Commentary A contract to James F. MacLaren Ltd, funded by the Private Waste and Water Management. (Specific budgetary program - Water Management: Private Waste and Water; Technical Services).

Budget \$42,000 (1972/73) \$20,000 (1973/74)

Report Report on Phase I published

Supervision N.D. Pappas, Supervisor, Technical Services

REMOVAL OF NUTRIENTS FROM TREATED DOMESTIC SEWAGE

Objective To adapt the application of different chemicals in septic tanks and in the tile field media, for removal of nutrients from treated sewage

Description Different chemical additives will be introduced into septic tank systems in order to remove phosphorus from sewage

Duration Projected 3-year duration (1973 - 1976)

Commentary An in-house research project of the Private Waste and Water Management Branch. (Specific budgetary program- Water Management; Private Waste and Water; Technical Services).

Budget \$15,000 (each of 1973/74, 1974/75, 1975/76)

Report To be prepared on completion. Interim reports if possible

Supervision N.A. Chowdhry, P. Eng., Senior Development Engineer
Dr. M. Brandes, P. Eng., Development Engineer

STUDIES ON SUB-SURFACE MOVEMENT OF EFFLUENT FROM SEPTIC TANK SEWAGE DISPOSAL SYSTEMS USING RADIOACTIVE AND DYE TRACERS

Objective To establish safe distances from receiving bodies (lakes, rivers, and streams), for location of private sewage disposal systems; data to be used in developing guidelines and standards for such systems.

Description Observation of sub-surface movement of traced septic tank effluent and testing of effluent for chemical and bacteriological quality before it reaches the receiving water body.

Duration Commenced 1972; open-ended

Site Chemong Lake (1972) Lake Simcoe
and Lake Couchiching areas (1973)

Commentary An in-house research project of the Private Waste and Water Management Branch. (Specific budgetary program- Water Management; Private Waste and Water, Technical Services).

Budget \$30,000 per annum

Report 1972 Interim report, Autumn 1973.

Supervision N.D. Pappas, Supervisor, Technical Services
Dr. M. Brandes, P. Eng. Development Engineer

STUDY OF APPROPRIATE SOIL TYPES FOR REMOVAL OF BACTERIA AND NUTRIENTS IN RAISED BED (IMPORTED FILL) FILTRATION SYSTEMS

Objective To improve effectiveness of raised bed sewage filtration techniques, for application to topography to septic tank systems.

Description Arrangements for raised filter beds and tile fields containing soils with and without chemical additives are being made. Field testing will be carried out in order to determine the removal of bacteria and nutrients from sewage

Duration Commenced 1973; to be completed 1976.

Commentary An in-house research project of the Private Waste and Water Management Branch. (Specific budgetary program- Water Management; Private Waste and Water, Technical Services).

Budget \$10,000 (1973) \$20,000 (1974/75) \$20,000 (1975/76)

Report Will be made when study completed Interim reports

Supervision Dr. M. Brandes, P. Eng., Development Engineer
Dr. H.T. Chan, P. Eng., Soils Engineer

UNDER-DRAINED FILTER BED SYSTEMS: WHITBY EXPERIMENTAL STATION

Objective To Investigate the suitability of soils to be applied in the field treatment of domestic sewage

Description Soils with different characteristics and with different chemical additives are applied for removing contaminants, bacteria and nutrients from sewage. The bacteriological and chemical properties of the septic tank effluent and of the final treated effluent are monitored periodically.

Duration Commenced 1969; open-ended Site Whitby Experimental Station

Commentary An in-house research project of the Private Waste and Water Management Branch. (Specific budgetary program-Water Management; Private Waste and Water, Technical Services).

Budget \$120,000 (since commencement) \$50,000 per annum

Report Interim report available in two parts

Supervision N.A. Chowdhry, P. Eng., Senior Development Engineer
Dr. M. Brandes, P. Eng., Development Engineer

Air Management Branch

ATMOSPHERIC REACTIONS - PHOTOCHEMICAL SMOG

Objective To establish firmly what relationship exists between automobile emissions and photochemical smog, and to assess the contribution of other nitrogen oxide emissions sources. Standards for abatement of nitrogen oxides and reactive hydrocarbons should ultimately be formulated.

Description A theoretical and experimental investigation aimed at selecting a systematic rationale for laboratory experiments and for their extrapolation to atmospheric conditions. Study of appropriate control strategy for photochemical smog products by development of mathematical models of kinetics and of isoreactivity contour maps. Study of the production of sulphate aerosol with SO_2 as precursor and hydrocarbons present. Determination of the effect of automobiles on concentrations of NO_x , hydrocarbons, and oxidants in Metro Toronto. Development of techniques for individual hydrocarbons analysis in the atmosphere; study of aerosol formation conditions and size, and chemical composition spectra of atmospheric aerosols as formed. Study of the temperature coefficients of photochemical smog reactions.

Duration Commenced 1971/72; five year duration

Commentary A research grant to the University of Toronto, Dr. C. N. Phillips, funded by the Air Management Branch, (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special Studies.)

<u>Budget</u>	\$20,000 (1971/72); \$30,000 (1972/73); \$26,000 (1973/74)
<u>Report</u>	<ol style="list-style-type: none">(1) Oxidants in Toronto (Interim)(2) An Analysis of the Oxidant Measurements in Toronto-Hamilton(3) Dispersion and Photochemical Reactions of Air Pollutants in Toronto(4) Various Factors Affecting Photochemical Smog(5) Chemical Reactivity of Hydrocarbons in Smog Formation(6) Estimation of Physiological Smog Symptom Potential from Chemical Reactivity of Hydrocarbons(7) Estimation of Reactivities of Olefins in Smog Formation from Molecular Structure
<u>Supervision</u>	Dr. E. F. Muller, Special Studies Scientist

CATALYSIS IN AIR POLLUTION CONTROL

Objective To improve the technology for abatement of anticipated air pollution problems.

Description Experimentation with a corona-discharge reactor in the field, to assess its technical applicability to various odor emission sources, and its effectiveness on individual odor-causing substances (hydrogen sulfide, carbon and nitrogen compounds).

Duration Six years; to be completed 1973/74

Commentary A research grant to the University of Western Ontario, Dr. K. A. Shelstad, funded by the Air Management Branch (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special Studies).

Budget \$6,000 (1973/74)

Report None as yet

Supervision Dr. E. F. Muller, Special Studies Scientist

COLLECTION AND ANALYSIS OF POLYCHLOROBIPHENYLS (PCBs)
IN THE ATMOSPHERE

Objective To offset a perceived time lag between apprehension of latent air pollution problems, and development of technology and abatement strategies to cope with them.

Description Monitoring of background levels of PCBs in ambient air at select sites, coupled with stack sampling at suspected emission sites.

Organic constituents present in ambient air are trapped by solvent absorption, and identified by the gas chromatograph - mass spectrometer technique.

Quantitation of PCBs using gas chromatography-electron capture detection instrumentation.

Duration One year (1973/74)

Commentary A research grant to the Ontario Research Foundation, Dr. G.H.S. Thomas, funded by the Air Management Branch (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special Studies).

Budget \$13,000

Report Anticipated, Spring 1974

Supervision Dr. E. F. Muller, Special Studies Scientist

COMPARATIVE FIELD TESTING OF NITRATION PLATE TECHNIQUES

Objective To facilitate firm assessment of the relationship between automotive emissions and photochemical smog, and the contribution of other nitrogen oxide emission sources.

Description In order to determine the effects of meteorological conditions on plate sensitivity, sample exposure series will be conducted for one-month and one-week durations respectively, under actual atmospheric conditions. Responses will be compared to continuous instrumental measurements. Further laboratory studies will investigate certain aspects of the nitration plate techniques, viz. the effect of other pollutants, examination of response to peak concentrations during exposure. The most suitable method of calibrating nitration plate data will be determined.

Duration One year (1973/74)

Commentary A research grant to the Ontario Research Foundation, Dr. S. C. Barton, funded by the Air Management Branch (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special studies).

Budget \$4,900

Report None as yet

Supervision Dr. E. F. Muller, Special Studies Scientist

CONSTRUCTION OF MARK II H₂SO₄ AEROSOL MONITOR

Objective To develop a remote monitoring system which will respond instantly to contaminant emission; and to further classify the nature of contaminants and associated potential health hazards.

Description To incorporate improvements and simplifications based on experience from field tests and re-evaluation of overall design, into Mark II model H₂SO₄ Aerosol Monitor. Specifically, to reduce complexity of moving parts by converting individual operations into a continuous operation, and to improve the design of moving parts.

Duration One year (1973/74)

Commentary A research grant to the Ontario Research Foundation, Dr. H. G. McAdie, funded by Air Management Branch (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special Studies).

Budget \$12,000

Report None as yet

Supervision Dr. E. F. Muller, Special Studies Scientist

CONSTRUCTION OF A MARK II REACTIVE HYDROCARBON MONITOR

Objective To facilitate examination of the relationship existing between automotive emissions and photochemical smog, and of the contribution of other nitrogen oxide emission sources.

Description Modification of the reactive hydrocarbon monitor, Beckman model 911 Photometer.

Duration One year (1973/74)

Commentary A research grant to the Ontario Research Foundation, Dr. S. C. Barton, funded by the Air Management Branch (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special Studies).

Budget \$13,900

Report None as yet

Supervision Dr. E. F. Muller, Special Studies scientist

DISPERSION OF PARTICULATE POLLUTION FROM LOW ELEVATION SOURCES

Objective To develop and validate a model of low elevation sources of particulates such as coke ovens, large roof monitors, coal piles, etc. Model will be used to predict impact of low elevation sources on air quality, and to compare outcomes of alternative decisions on source control.

Description Starting with existing urban Air Quality simulation models to develop a model of the atmospheric dispersion of particulate matter with special emphasis on large, low elevation sources including coke ovens, coal piles, roof monitors and roof-level vents, autos, and others. Model will simulate air quality resulting from alternative decisions on the control of particulate emissions.

Duration May, 1973 to december, 1973

Commentary An in-house research project by the Air Management Branch (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Air Quality and Meteorology).

Budget 10 man-days per month for professional staff (model project engineer, meteorologist).

Report Status reports have been issued, including "A Summary of Projects to Evaluate the Effectiveness of the Mathematical Model for Predicting Particulate Concentrations" July 20, 1973.

Supervision K. Trent, Project Engineer
A. E. Boyer, P. Eng.

DISTRIBUTION OF AUTOMOBILE - GENERATED SUSPENDED PARTICULATES
ADJACENT TO URBAN HIGHWAYS AND PREDICTION OF AUTOMOBILE - GENERATED
POLLUTANT CONCENTRATIONS IN CITY STREET SUBCANYONS

Objective To explore the nature, size and composition of particulate matter as additional parameters for assessment of impact on human health and comfort.

Description Monitoring program using a Bausch & Lomb Model 40-1 Dust Collector and Anderson Hi-vol sampling heads.

<u>Duration</u>	Commenced 1972/73	<u>Site</u>	Location adjacent
	Completed 1973/74		to Highway 401

Commentary A research grant to the University of Waterloo, Dr. P. R. Slawson, funded by the Air Management Branch (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special studies).

Budget \$14,725 (1972/73); \$10,000 (1973/74)

Report Published in limited circulation technical publications; full report under project title.

Supervision Dr. E.F. Muller, Special Studies Scientist

EFFECTS OF AIR POLLUTION ON VEGETATION

Objective To screen resistant plant species, and determine desirable air quality criteria with respect to vegetation, complementing surveillance function.

Description

- (1) To assess the effects of airborne arsenic compounds on vegetation.
- (2) Development of clonal ramets sensitive and resistant to SO₂ and fluorides.
- (3) To determine the protective effects of roadside dust on plants sensitive to atmospheric ozone and SO₂.
- (4) To determine the frequency of occurrence and the activities of saprophytic flora in a sulphur-polluted environment.
- (5) Testing of composted bark and animal manure for phytotoxicity (in collaboration with the University of Guelph).

Duration

- (1) Commenced 1972; completion indefinite
- (2) Commenced 1970; completion 1974
- (3) Commenced 1972; completion indefinite
- (4) Commenced 1972; completion 1974
- (5) Commenced 1972; completion 1973

<u>Commentary</u>	An in-house research project by the Air Management Branch (Specific Budgetary Program - Air and Land Control: Air Management; Special Studies).
<u>Budget</u>	\$20,000, salaries and capital expenditure, 1973/74.
<u>Report</u>	Available for (5); reports will be prepared for (1), (3), and (4).
<u>Supervision</u>	Dr. S. N. Linzon, Chief, Phytotoxicology Section

EMISSION CONTROL FROM GRAIN DRIERS

Objective To study design changes for grain driers, with or without positive dust control equipment, for the purpose of providing dust abatement techniques for the grain drying process which will satisfy Ontario Regulation #15 (Schedule 1, inert particulates).

Description Specifically, factors such as pre-cleaning, moisture removal per pass, and air flow during drying will be examined. Noise generation and variations in grain quality will also be considered. Dust collectors currently available will be evaluated, as well as innovative techniques.

Duration Two Years

Commentary A research grant to the University of Guelph, Dr. A. Meiering, funded by the Air Management Branch (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special studies).

Budget \$26,000 (1973/74)

Report None as yet

Supervision Dr. E. F. Muller, Special Studies Scientist

ENVIRONMENTAL CONTROL AND SAFETY ASPECTS OF FLARES

Objective To perfect technology for abatement of anticipated air pollution problems.

Description Development of reliable techniques for predicting the shape and length of flames over elevated flares at the design conditions for various major contingencies. Measurement of degree of complete combustion in a turbulent diffusion flame in a crosswind; measurement of NO_x production in such a flame. Study of mechanism of smoke formation. Measurement of thermal radiation from turbulent diffusion flames in a cross-wind.

Duration Commenced 1973/74; three year duration

Commentary A research grant to the university of Waterloo, Dr. T. A. Brzustowski, funded by the Air Management Branch (Specific Budgetary Program - Air and Land pollution Control: Air Management; Special Studies).

Budget \$5,000 (1973/74)

Report None as yet

Supervision Dr. E. F. Muller, Special Studies Scientist

EXPLORATION OF COMPONENTS OF URBAN TORONTO "DUST" DOME

Objective To supplement university grant research on urban "dust" domes with data on the nature and quality of contamination present in the atmosphere above urban Toronto.

Description Ten flights in light aircraft equipped to measure occurrence of SO₂, NO_x particulate matter, etc., and to relate the contaminant density to meteorological factors.

Duration Commencing Summer 1973; to continue through Spring 1974.

Commentary A contract to private contractor by the Air Management Branch (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special Studies).

Budget \$19,529

Report None as yet; expected by Summer 1974

Supervision Dr. E. F. Muller, Special Studies Scientist

FATE OF ATMOSPHERIC SULPHUR DIOXIDE AND ASSOCIATED SUBSTANCES
SCAVENGED BY RAIN AND SNOW

Objective To assess acceptable rates of redeposition of smelter emissions by determining their long-term environmental effects. The study anticipates industrial pressure to extend deadlines for emission cutback orders.

Description Continue analysis, on a monthly basis, of a 30 + precipitation network for major ions, soluble and total metals, sulfates, etc., with location of three new stations south-west of Sudbury to assess derived transboundary material from the U.S.A. Analysis of stack and plyme samples for S (32/34); analyses of stack samples for zeta potential of particulates, SEM and X-ray diffraction along with bulk ehemical analysis. Study the metal-ligand association in precipitation. Sample four study lakes, four outlying lakes, on an event basis.

Duration Commenced 1972/73; five year duration.

Commentary A research grant to McMaster University, Dr. James R. Kramer. (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special Studies)

Budget \$20,000 (1972/73); \$31,620 (1973/74)

Report Fate of Atmospheric Sulfur Dioxide and Related Substances as Indicated by Chemistry and Precipitation (1972/73)

Supervision Dr. E. F. Muller, Special Studies Scientist.

INFORMATION SEARCH - PROPERTIES, SOURCES AND ENVIRONMENTAL EFFECTS OF EXOTIC AIR POLLUTANTS

Objective To offset a perceived time lag between apprehension of latent air pollution problems, and development of technology to cope with them.

Description A survey of some 2000 publications, providing data on the following exotic pollutants: Ammonia, Arsenic, Asbestos, Barium, Beryllium, Boron, Cadmium, Chromium, Copper, Fluorine, Hydrocarbons, Hydrochloric Acid, Hydrogen Sulfide, Iron, Lead, Manganese, Mercury, Nickel, Phosphorus, Selenium, Vanadium and Zinc.

Duration Commenced 1971/72; to be completed 1973/74

Commentary A research grant to the University of Windsor, D.H.W. Allan, funded by the Air Management Branch. (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special Studies)

Budget \$2,445 (1973/74)

Report (1) A "KWIC" Index of Exotic Air Pollutant Literature, by A.W. Gnyp, Price, St. Pierre, Chongpison, Mozzon.
(2) A Continuation and Extension of the Evaluation of Factors Affecting Stack Sampling (in two parts), by Gnyp, Price; publ I.R.I., U. of Windsor
(3) Final Report, Literature Survey - September, 1973

Supervision Dr. E.F. Muller, Special Studies Scientist

INVESTIGATION OF ACOUSTIC-AEROSOL PROCESSES

Objective To perfect technology for abatement of anticipated air pollution problems; and in particular, to improve the technique of acoustic coagulation so as to reduce high operating and capital costs currently associated with conventional methods of generating sound.

Description Research is being directed toward improved acoustic field design, and more efficient sound generation. Specifically, basic finite-amplitude acousto-aerosol mechanisms are being studied.

Duration Commenced 1971/72; to be completed 1973/74.

Commentary A research grant to the University of Toronto, Dr. D. S. Scott, funded by the Air Management Branch. Industrial application is being conducted by Chubb Industries Ltd.; primary development is sub-contracted to the Ontario Research Foundation. (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special Studies)

Budget \$5,000 (1973/74)

Report Interim reports available

Supervision Dr. E. F. Muller, Special Studies Scientist

LAKE SEDIMENT STUDIES - SUDBURY (REDEPOSITION OF AIRBORNE SMELTER EMISSIONS)

Objective To assess acceptable rates of redeposition of smelter emissions by determining their long-term environmental effects.

Description Collection of data on the rate per volume and total rate of export of metals from three watersheds in the Sudbury region, as base data for developing techniques to permit determination of metals budget for lakes and/or watersheds. Determine the degree to which presence of a lake or a watercourse influences the concentration of metals lower in the watercourse, and the distribution of metal content among the major subunits of the lake ecosystem.

<u>Duration</u>	Commenced 1973/74 five year duration	<u>Site</u>	Whitson, Nelson, Fairbanks Lakes
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Commentary A research grant to Laurentian University, Dr. J. P. Morris funded by the Air Management Branch. Where their programs are not totally integrated, the water Quality Branch and the Ministry of Natural Resources are all conducting tests towards similar objectives on the same lakes. (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special Studies)

<u>Budget</u>	\$10,000 (1973/74)
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<u>Report</u>	None as yet
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<u>Supervision</u>	Dr. E. F. Muller, Special Studies Scientist
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LIDAR INVESTIGATION OF THE URBAN ATMOSPHERE

Objective To develop a remote monitoring system which will respond instantly to contaminant emission; and to further classify the nature of contaminants and associated potential health hazards.

Description The ruby laser lidar unit acquired and modified in the 1972/73 fiscal year will be employed as a mobile facility and will continue a remote monitoring program of atmospheric properties. Emphasis will be placed on lidar measurements of smoke plumes, and an intensive field study will focus on the INCO stack plume at Sudbury.

Duration Commenced 1972/73; to be completed 1973/74

Commentary A research grant to York University, Dr. A. I. Carswell, funded by the Air Management Branch (Specific Budgetary Program - Air and Land Pollution Control: Air Management Branch; Special Studies)

Budget \$10,000 (1972/73), \$15,000 (1973/74)

Report PhD thesis, R. W. McNeil, papers presented at scientific meetings; report to AMB, Spring 1973.

Supervision Dr. E. F. Muller, Special Studies Scientist

LIDAR STUDY OF POLLUTANTS AND AEROSOLS IN THE LONDON AREA

Objective To develop a remote monitoring system which will respond instantly to contaminant emission; and to further classify the nature of contaminants and associated potential health hazards, i.e. size distribution of suspended particulate matter; the respirable non-respirable factor in particulate measurement; presence of sulfuric acid aerosols; differentiation between gaseous and particulate fluorides.

Description Assemble a laser radar (lidar) with scanning optics at an elevated position overlooking the city of London, to observe Mie backscattering from particulates in the air. Record lidar signatures for the urban area in various weather systems, over a period of at least one year. Analyze these signatures for information on sources of airborne particulate, the particulate diffusion away from the source, the particulate concentration, and the effects of local weather on particulate diffusion.

Duration Commenced 1972/73; two year duration.

Commentary A research grant to the University of Western Ontario, Dr. D. R. Hay, funded by the Air Management Branch (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special Studies)

Budget \$15,000 (1972/73); \$16,000 (1973/74)

Report None as yet

Supervision Dr. E. F. Muller, Special Studies Scientist

ODOUR CONTROL IN ANAEROBIC SYSTEMS

Objective To perfect technology for abatement of anticipated air pollution problems.

Description Laboratory and field experiments will be conducted on whey, chicken manure, potato processing wastes and wastes from rendering plants, to determine the effectiveness of formalin, formalin-sulfur acid and formalin-formic acid treatments for eliminating air pollution problems associated with the disposal of wastes from anaerobic storage facilities. Tests will also determine whether chemical treatments have harmful effects of soil microbes.

Duration One year (1973/94)

Commentary A research grant to the University of Guelph, Dr. K. R. Stevenson, funded by the Air Management Branch (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special Studies)

Budget \$12,820

Report None as yet

Supervision Dr. E. F. Muller, Special Studies Scientist

ODOUR PREVENTION IN LIVESTOCK ENTERPRISES

Objective To perfect technology for abatement of anticipated air pollution problems.

Description To develop an odour control system involving the application of synthetic and natural humic acids to the concentration of selected odour components produced by poultry and swine; and to implement a field study that will test the practicality of the proposed odour control system.

Duration One year (1973/74)

Commentary A research grant to the University of Guelph, Dr. R. R. Hacker, funded by the Air Management Branch (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special Studies)

Budget \$12,205

Report None as yet

Supervision Dr. E. F. Muller, Special Studies Scientist

STUDY OF THE CHANGES INDUCED IN SOILS OF THE SUDBURY REGION AS A RESULT OF AIRBORNE SO₂ EMISSIONS

Objective To assess acceptable rates of redeposition of smelter emissions be determining their long term environmental effects. The study anticipates industrial pressure to extend deadlines for emission cutback orders now in force.

Description A comparative sampling program of soils from three representative site types will be conducted:

- (1) areas remote from any effects of smelter emission;
- (2) areas not yet affected by smelter emissions, but within predicted fallout pattern from "superstack" gas flues;
- (3) areas which have been subjected to smelter emissions continuously for a considerable length of time.

Parameters measured will include particle size distribution, pH cation exchange capacity, exchangeable cations, base saturation, organic matter content, total sulfur conductivity, chlorides, titrable acidity. In conjunction, a laboratory study will examine the weathering changes that would be induced under controlled leaching of solid using H₂SO₄ and relating it to levels of SO₂ emission and precipitation.

Duration Commenced 1973/74; five year duration

Commentary A research grant to the University of Guelph, Dr. R. L. Thomas, funded by the Air Management Branch. Water Quality Branch is doing related studies of water bodies in this region. (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special Studies)

Budget \$10,000 (1973/74)

Report None as yet

Supervision Dr. E.F. Muller, Special Studies Scientist

TRACE ANALYSIS OF AIRBORNE PARTICULATE MATTER AND OTHER ENVIRONMENTAL CONTAMINANTS

Objective To explore the nature, size and composition of particulate matter as additional parameters for assessment of impact on human health.

Description Interface of plasma chromatograph with gas chromatograph/mass spectrometer system; addition of a dedicated computer for data reduction. Development of rapid analytical methods for trace analysis of compounds found on airborne particulate matter.

Duration Commenced 1972/73; two year duration

Commentary A research grant to the University of Waterloo, Dr. F. W. Karasek, funded by the Air Management Branch (Specific Budgetary Program - Air and Land Pollution Control: Air Management; Special Studies)

Budget \$3,500 (1972/73); \$13,000 (1973/74)

Report (1) K. M. Gilroy, "Trace Analysis of Complex Organic Mixtures by GC/MS Techniques", M. Sc. Thesis, University of Waterloo, Waterloo, Ontario, April, 1973.

(2) R. J. Smythe, "Application of High Resolution Gas Chromatography and Mass Spectrometry to the Analysis of Engine Exhaust Emissions", Ph.D. Thesis, University of Waterloo, Waterloo, Ontario, April, 1973

(3) R. C. Lao, R. S. Thomas, H. Oja, and L. Dubois, Anal. Chem., 45, XXX, May 1973.

(4) F. W. Karasek, D. M. Kane, and O. S. Tatone, Anal. Chem., 45, XXX, May, 1973

Supervision Dr. F. F. Muller, Special Studies Scientist

Waste Management Branch

APPLICATION OF SEWAGE SLUDGE TO MINE TAILING AREAS

Objective To explore the fundamentals of applying sewage sludge to tailings areas, for the purpose of inducing vegetation growth.

Description Program not finalized

Duration To commence 1973/74; duration uncertain Site INCO Tailings area, Sudbury

Commentary A research grant (pending) to Laurentian University, funded by the Waste Management Branch. (Specific Budgetary Program- Air and Land Pollution Control; Waste Management; Agriculture Waste & Sewage Sludge).

Budget \$10,000 (full project value - approximate)

Report None as yet

Supervision G.M. Wood, Planning Supervisor

AT-SOURCE NEWSPRINT SEGREGATION

Objective To compare effectiveness of various programs for encouraging homeowners to separate newsprint from other solid waste prior to collection.

Description Two operations are being experimented with:
 (1) Curb-side pickup on regular collection days
 (2) Curb-side pickup available on request with 24 hour notice

<u>Site</u>	(1) Brampton	<u>Duration</u>	Commenced 1973/74; may be adopted
	(2) Lindsay		as on-going program

Commentary An in-house research project of the Waste Management Branch.
 (Specific budgetary program- Air and Land Pollution Control: Waste Management; Municipal & Industrial Solid Waste).

Budget \$20,000 (approximately)

Report None as yet

Supervision G.M. Wood, Planning Supervisor

CREATIVE USES OF INDUSTRIAL WASTE

Objective To develop designs for re-uses of industrial wastes prevalent in Toronto, and to explore the sources of capital and manpower to sustain the reclamation process as an independent commercial enterprise.

Description A survey of Toronto industries (1200 questionnaires) yielded data on materials available; representative samples were collected. Student designs were collected for possible uses of the materials, and prototypes built. (Chairs, vinyl products, planters, etc.) Proposition- that materials be collected en masse, converted in Correctional institutions, and applied to government and private demands.

Duration June to September, 1973

Commentary A research grant to the Student Enterprise Assistance League (SEAL) Funded by the Ministry of Environment. The project operated in co-operation with Watts from Waste Committee, Ministry of the Environment. (Specific Budgetary Program- Ministry of the Environment; S.W.E.E.P.)

Budget \$8,000 (1973/74)

Report To be prepared September 1973

Supervision No direct supervisor from branch

DERELICT MOTOR VEHICLE PROGRAM

Objective To develop costing and techniques for the removal, transportation and recycling of Derelict Motor Vehicles.

Description Three pilot studies to compare efficiencies of different management structures for DMV removal and reclamation:

I Ministry supervised operation, private contract to move hulks.

II Ministry engages municipality to undertake full management of disposal, municipality assumes ownership of DMVs.

III Ministry engages countries to manage transactions, but maintains legal ownership of DMVs itself.

Sites I- Sault Ste. Marie; II- Thunder Bay; III- Renfrew County.

Duration Commenced with a survey, 1972/73; pilot study to be completed 1973/74

Commentary Three separate contracts with Private Enterprise, Municipal Governments of Thunder Bay, and Renfrew County respectively, funded by the Waste Management Branch. (Specific Budgetary Program- Air and Land Pollution Control: Waste Management; Abandoned Automobiles).

Budget \$100 ,000 (1973/74)

Report None as yet

Supervision G.M. Wood, Planning Supervisor

ENERGY RECOVERY FROM REFUSE: A FEASIBILITY STUDY

Objective To explore the use of beneficiated refuse as a fuel for utility boilers, cement kilns, etc. One component of " experimental reclamation plant" study.

Description An analysis of the potential, technical and economic, for utilizing waste as a fuel at the Lakeview Generating Station.

Duration August to October 31 ,1973 Site Lakeview Generating Plant,
Metro Toronto

Co-operation "Watts from Waste" Committee; Task Force on Solid Waste

Commentary A contract to Horner and Shifrin, Inc, Consulting Engineers, funded by the Waste Management Branch. (Specific Budgetary Program- Air and Land Pollution Control: Waste Management; Municipal & Industrial Solid Waste).

Budget \$24,500 contract value

Report To be completed by October 31, 1973

Supervision G.M. Wood, Planning Supervisor

EXPERIMENTAL RECLAMATION PLANT

Objective To design and build a facility to accommodate pilot programs generating recycling techniques for all classes of waste: municipal, domestic, industrial, construction. To construct a recycling model, relating processes developed to cost and market factors.

Description A consulting firm will be hired to evolve detailed design and specifications for the plant. The pilot programs are not as yet developed.

<u>Duration</u>	Commenced 1972/73; projected completion of plant construction - 1976/77; process development open-ended.	<u>Site</u>	Metropolitan Toronto
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Commentary An in-house research project of the Waste Management Branch. Possible federal cost sharing for related research; co-operation expected from Metropolitan Toronto. (Specific Budgetary Program- Air and Land Pollution Control; Waste Management; Projects Planning).

Budget \$200,000 (1973/74) - design implementation of plant; capital cost
projection \$3 to \$5 million.

Report None as yet

Supervision G.M. Wood, Planning Supervisor

GAS MIGRATION FROM THE BIRRELL- TRUSTRUM SANITARY LANDFILL SITE

Objective To investigate the problem of sub-surface methane gas migration from the landfill site, occurring beneath frost level.

Description Remedial techniques investigated:

- (1) Installation of interceptor ducts to prevent migration
- (2) Addition of vacuum pumps to interceptor ducts

Duration Commenced 1971/72; completed 1973 Site Birrell-Trustrum Landfill,
Toronto

Commentary A contract with the University of Toronto Environmental Institute, Dr. Jones, funded by the Waste Management Branch. (Specific Budgetary Program-Air and Land Pollution Control; Waste Management; Municipal and Industrial Solid Waste).

Budget \$12,800 (full project value)

Report Interim report complete

Supervision G.M. Wood, Planning Supervisor

LAND DRAINAGE REFERENCE (IJC) - POLLUTION POINT SOURCE IDENTIFICATION

Objective To study the effects of various land use activities on the quality of Great Lakes Boundary Waters. Alternative Management techniques will be recommended.

Description The Branch will identify point sources of pollution within the range of its expertise, and contribute data to demonstrate the identifiable point source contribution to the total pollution load balance.

Co-operation Federal government, U.S. I.J.C. authorities, related Ministries and branches of the Ministry of the Environment.

Duration Indefinite

Commentary An in-house project of the Waste Management Branch. The investigation represents input from this branch to a major co-operative research program by the Federal Government American I.J.C. authorities, related Ministries and branches of the Ministry of the Environment).

Budget \$5,000 committed to date

Report To be issued by I.J.C.

Supervision G.M. Wood, Planning Supervisor

LITTER ANALYSIS- ROADSIDES

Objective To analyze the litter found on Ontario roadsides during the summer months, especially with respect to the contribution of consumer packaging.

Description Research teams collect litter along township roads, rural roads, and highways in Southern Ontario. Material collected is categorized under nine headings, for its type. Other factors noted are road characteristics, and weather conditions.

Duration Commenced 1972/73; four-month data collection period; may be extended into year-round activity.

Commentary A SWEEP program project funded by the Ministry of the Environment, (Specific Budgetary Program- Ministry of the Environment; SWEEP).

Budget \$75,000 (1973/74)

Report Master report programmed in E.D.P. system. 1972/73 report submitted to Solid Waste Task Force.

Supervision G.M. Wood, Planning Supervisor

LITTER ANALYSIS- WASTE DISPOSAL SITES

Objective To analyse waste occurring at public waste disposal facilities, especially with respect to consumer packaging contribution.

Description A five-man special projects team is analysing garbage at selected disposal sites (incinerators, landfills) and recreation areas in urban and rural Ontario.

Duration 1973/74- summer only

Commentary An in-house research project of Waste Management Branch. (Specific Budgetary Program- Air and Land Pollution Control; Waste Management, Litter).

Budget \$10,000 (1973/74)

Report Published report to appear, at project completion

Supervision G.M. Wood, Planning Supervisor

RED WORM COMPOSTING

Objective To experiment with effectiveness of stabilizing organic material, utilizing red worms as mixing agents, and "harvesting" worms as an income supplement.

Duration 1972/73

Site Newmarket

Commentary A research grant to Mr. Klauck, Newmarket, funded by the Waste Management Branch. (Specific Budgetary Program- Air and Land Pollution Control; Waste Management).

Budget \$1,000 full project value

Report No.

Supervision No direct supervision.

ON-SITE COMPOSTING, MUNICIPAL WASTE

Objective To explore the feasibility of applying shredded municipal refuse and sewage sludge to agricultural lands, for the cultivation of limited-use crops (animal feed).

Description Experimental compost applied to a silage corn crop on a two-acre test site, ground water tested for conduct of heavy metals, bacti, and nutrients. Crop yield will be monitored.

Duration Commenced 1971/72; projected completion 1974/75

Commentary A research grant to the University of Guelph, Prof. L. Webber, funded by the Waste Management Branch. (Specific Budgetary Program- Air and Land Pollution Control; Waste Management, Projects and Planning).

Budget \$12,000 (1973/74); overall \$7,000 per annum

Report Interim report completed

Supervision G.M. Wood, Planning Supervisor

SANITARY LANDFILL STUDY

Objective To study the environmental impacts of landfill sites, especially with respect to migration of leachates.

Description Monitoring by test holes, of ambient ground water. Analysis of content for heavy metals, bacti, nutrients. Four old sites used to establish background data; new site selected to determine improvements achieved.

Duration Commenced 1971/72; projected completion 1974/75

Site Elmira, Brantford, Guelph,
Old Waterloo site

Commentary A research grant to the University of Waterloo, Prof. G.A. Farquhar, funded by the Waste Management Branch. (Specific Budgetary Program- Air and Land Pollution Control: Waste Management; Municipal & Industrial Waste).

Budget \$4,800 (1973/74; full project value \$40,000 approximately

Report Interim reports completed

Supervision G.M. Wood, Planning Supervisor

WASTE DISPOSAL AREA PLANNING STUDIES

Objective To investigate the feasibility, on an area-by-area basis, of substituting a region-centred waste disposal facility for conventional location of sites according to municipal political boundaries.

Description Although essentially an "operations" activity, the planning studies constitute valuable prototype- development for reorganizing services along regional lines. Focuses include collection, transportation and disposal of waste.

Duration Commenced 1971/72; to continue to 1978 minimum

Site Hamilton-Wentworth; Oxford County; Halton County; Prince Edward County; Hastings County; Ottawa-Carleton; Regional Municipality of Niagara; Regional Municipality of Sudbury; Regional Municipality of Waterloo.

Commentary An in-house research project of Waste Management Branch. (Specific Budgetary Program- Air and Land Pollution Control: Waste Management; Litter).

Budget \$250,000 (non-loan expenditure to date)

Report Final report from Oxford County

Supervision G.M. Wood, Planning Supervisor

Pesticides Control Service

Objective To assess pest prevalence, and damage inflicted in relation to the following practices:

- (a) Chemical pest control
- (b) Non-chemical control,
- (c) No controls applied

To develop safe, more acceptable alternatives to current practices.

Description Selected small domestic garden sites in suburban Toronto and Southern Ontario to be divided into the three management categories for one growing season. Periodic monitoring for pest occurrence, crop yield etc. Non-chemical techniques include traps, botanical unsecticides, anti-feeding compounds.

Duration Commenced 1973/74; projected to extend over 2 - 3 growing seasons.

Commentary A research grant to the University of Toronto, Dr. G.B. Orlob, funded by Pesticides Control Branch. (Specific Budgetary Program- Air and Land Pollution Control: Pesticides Control.)

Budget \$6,000 (1973/74)

Report None as yet

Supervision Pesticides Advisory Committee

BITING FLY ABATEMENT

Objective To develop a comprehensive larvicide and adulticide mosquito control program to be administered by the Pesticides Control Service. Related research activities will probably be undertaken.

Description Details of program currently being developed; research aspects will probably be involved, but whether it will be of a fundamental or applied nature is as yet uncertain.

Cooperation Canadian Council on Biting Flies

Duration Commencing 1973 /74; program is open - ended.

Commentary An in house- research project of the pesticides Control Service. The program will be developed in cooperation with the Canadian Council on Biting Flies. (Specific Budgetary Program- Air and Land Pollution Control: Pesticides Control

Budget Undetermined as yet.

Report None until program established.

Supervision R.E. Moore, Chief, Pesticides Control Service.

CONTROL OF THE ONION MAGGOT, *HYLEMYA ANTIQUA* (MEIGEN), BY USE OF THE STERILE MALE
TECHNIQUE

Objective To evaluate the biological and physical parameters that determine the successful use of the sterial male technique to control the onion maggot.

Description Both laboratory and field tests will be conducted, primarily to determine the optimal age and stage for cobalt 60 sterilization of flies, competitiveness of treated flies and procedure and time for release. A small scale release will be made in 1973.

Duration Open-ended

Site Holland Marsh (Field Studies)

Commentary A research grant to the University of Guelph, Ontario Agricultural College, department of Environmental Biology, Dr. F. McEwen, funded by Pesticides Control Service. Cooperative research by Dr. C. R. Harris Agriculture Canada. London, Ontario. (Special Budgetary Program- Air and land Pollution Control: Pesticides Control.)

Budget \$18,000 (1973/74)

Report None as yet

Supervision Pesticides Advisory Committee

DERIVATION OF A CARROT BLIGHT SPRAYING SCHEDULE CORRELATED WITH WEATHER CONDITIONS WHICH FOSTER FUNGAL GROWTH

Objective To determine whether more efficient and environmentally safe scheduling practices can be attained for fungicide spraying, by substituting applications during peak disease development stages (indicated by pathology of the plant, and meteorological factors) for regular - interval applications.

Description Study of reactions of fungi causing carrot blight, to temperature, humidity, light, and leaf wetness duration, in an incubation chamber. Refinement of resulting model by field testing.

Duration Not specified

Site Bradford Marsh

Commentary A research grant to the University of Guelph, Land Resource Science, Dr. T.J. Gillespie, funded by the Pesticides Control service. (Specific Budgetary Program- Air and Land Pollution Control: Pesticides Control.)

Budget \$7,175 (1973/74)

Report None as yet

Supervision Pesticides Advisory Committee

THE EFFECT OF CARBOFURAN ON THE PHYSIOLOGY OF PLANTS

Objective To explore the possibility that application of carbofuran produces physiological changes in corn plants, hence increasing yield quite apart from its insect control function. Tests will also ascertain the environmental conditions under which carbofuran does increase crop yield.

Description In an insect-free environment, the effect of carbofuran will be determined on various plant and soil types, in sterilized and non-sterilized soil and possibly in hydroponic growth tanks.

Duration One year. (1973/74)

Commentary A research grant to the University of Guelph, Dept. of Environmental Biology, Dr. R.A. Fletcher, funded by the Pesticides Control. (Specific Budgetary Program- Air and Land Pollution Control: Pesticides Control.)

Budget \$5,000

Report None as yet

Supervision Pesticides Advisory Committee

EFFECT OF DURSBAN APPLIED IN THE FORM OF A LARVICIDE PREPARATION UPON THE MICRO-FLORA UPTAKE IN BOTTOM SEDIMENTS

Objective To determine the seasonal persistence of Dursban, its incorporation into, and its excretion from, sedimentary micro- flora.

Description Pilot studies in a water body contiguous to the site will provide indicators and parameters for applications to small, self-contained areas of the test site. A plan will be formulated for major studies involving the whole test site.

Duration Open - ended

Site Great Lakes Research Station,
Baie du Dore, Lake Huron.

Commentary A research grant to the University of Toronto, Institute of Environmental Sciences and Engineering, Dr. J.R. Brown, funded by the Pesticides Control Service. (Specific Budgetary Program- Air and Land Pollution Control: Pesticides Control.)

Budget \$5,000 (1973/74)

Report None as yet

Supervision Pesticides Advisory Committee

EFFECT OF DURSBAN (USED AS A MOSQUITO LARVICIDE) ON MICROSCOPIC PLANKTONIC
AND MICROBIAL FORMS OF LIFE

Objective To explore the effects of application of Dursban on the fundamental, processes of zooplankton and phytoplankton, and assess the ramifications with respect to their roles in the food chain, and as agents of decomposition and nutrification. To attempt to set up an appropriate pesticide model for microscopic aquatic forms.

Description Short-term and long-term (one year) assessment of effects of the three applications of Dursban on organic decomposition in artificially constructed ponds. Evaluation of changes in diversity indices on organisms grouped according to ecological activity.

Duration One year (1973/74)

Commentary A research grant to York University, Dept. of Biology, Dr. M. Boyer, Dr. C.D. Fowle, funded by Pesticides Control Service. (Specific Budgetary Program- Air and Land pollution Control: Pesticides Control.)

Budget \$6,000

Report None as yet

Supervision Pesticides Advisory Committee

EFFECTS OF APPLICATIONS OF DIPYRIDYL HERBICIDES TO SOIL AND WATER ON MICROBIAL
NON-TARGET ORGANISMS

Objective To determine what possible effects dipyridal herbicides may have on fundamental activities of microbiological life forms in soil and water.

Description Monitoring migration of applied herbicides in soil and water (field and laboratory trial applications). Assessment of effects of applications on numbers, and biochemical activities, of representative samples of the microbical population in soils and sediments.

Duration One year (1973/74)

Commentary A research grant to the University of Waterloo, Department of Biology, Dr. C.I. Mayfield. (Specific Budgetary Program- Air and Land Pollution Control: Pesticides Control).

Budget \$5,000

Report None as yet

Supervision Pesticides Advisory Committee

ELECTROSTATIC APPLICATION OF PESTICIDES IN ORCHARDS AND FIELD CROPS

Objective To explore the feasibility of using minimum-waste electrostatic pesticide application techniques for orchard and field crop foliage, and to develop a working applicator model, suitable for mounting on a tractor.

Description The thesis will be explored, that the properties of a tree as a Faraday Cage facilitate electrostatic application of pesticides by aerosol injection of spray into the field-free region. Testing will be under field conditions.

Duration One year (1973/74)

Site Test orchard, University of Guelph

Commentary A research grant to the University of Western Ontario, Faculty of Engineering Science, funded by the Pesticides Control. (Specific Budgetary Program-Air and Land Pollution Control: Pesticides Control.)

Budget \$5,000

Report None as yet

Supervision Pesticides Advisory Committee

Objective To establish optimum sampling methodology for analysing the effects of municipal roadside spraying of herbicides, as distinct from agricultural applications. Pilot studies for a major program to determine short and long term effects of municipal roadside spraying activities. Program directives may develop as a result of the findings.

Description Samples of water, sediment and vegetation growth taken from specific sites, before, during and after spraying. Data correlated to meteorological conditions, water temperature.

Duration Pilot Studies 1973/74

Site Hillman Marsh, South Western Ontario

Cooperation Biology Section, Water Quality Branch

Commentary An in-house research project of the Pesticides Control Service conducted in cooperation with the Water Quality Branch, Biology Section. (Specific Budgetary Program- Air and Land Pollution Control: Pesticides Control.)

Budget Not determined

Report None as yet

Supervision R.E. Moore, Chief, Pesticides Control Service.

INTERACTIONS OF TRIAZINE HERBICIDES WITH SOIL AND FRESH WATER
ENVIRONMENTS (BLADDEX & SENCOR)

Objective To eliminate some of the inadequacies in documentation of mechanisms of transport from soils to aquatic systems, and of the physical, chemical and biological properties of these substances in the latter system.

Description Examination of the microbial and chemical transformations of triazine herbicides in selected Ontario soils; study of leaching and surface displacement of parent chemicals and major degradation intermediates. Study of mechanisms and rates of decomposition in aqueous and sedimentary phases, effects of interaction with urban and industrial effluents. Study of effects of chemicals on aquatic biological activities.

Duration One year. (1973/74)

Commentary A research grant to the University of Guelph, Department of Microbiology, Dr. C. T. Corke, funded by the Pesticides Control Service (Specific Budgetary Program - Air and Land Pollution Control: Pesticides Control)

Budget \$7,500

Report None as yet

Supervision Pesticides Advisory Committee

PESTICIDE RESIDUE MONITORING

Objective To determine the relative persistence of chlorinated hydrocarbons, in parent and breakdown forms, in human and animal milk and tissue, soils and water. The program follows up the ban of use of these chemicals, and aims to establish the length of time necessary for elimination of residues from the environment.

Description Analyses of eggs, animal fat, human milk and tissue obtained from hospitals and veterinary colleges whenever presence of pesticide residues is suspected. Regular monitoring of surface and sub-surface waters, and soils at selected sites.

Duration 1968/69 to 1973/74

Commentary An in-house research project of the Pesticides Control Service, with the co-operation of the Provincial Pesticides Lab. (Specific Budgetary Program - Air and Land Pollution Control: Pesticides Control)

Budget Not determined

Report Partial formal report will issue at the end of study

Supervision R. E. Moore, Chief, Pesticides Control Service

PESTICIDE RESIDUES - SOUTHERN ONTARIO TOBACCO BELT WATERSHED STUDY

Objective To assemble data on pesticide residues occurring in the four major waterways draining a pesticide high usage area; and to determine the half-life of some varieties of pesticide.

Description Samples of soils, water, livestock, water supply, silage, hay, and milk and beef produced in the area, are tested for indicator chemicals DDT, dieldrin, DDE/TDE. Fish and sediment studies conducted in upper drainage system, as well as receiving bay.

Duration Commenced early 1969; completed 1973/74.

Commentary An in-house research project of the Pesticides Control Service, in co-operation with the Ministry of Natural Resources and the Provincial Pesticides Lab. (Specific Budgetary Program - Air and Land Pollution Control: Pesticide Control)

Budget Not determined

Report To be published by Dr. R. Frank, Provincial Pesticides Laboratory.

Supervision R. E. Moore, Chief, Pesticides Control Service

POTENTIAL HAZARD TO BIRDS FROM GRANULAR FORMULATIONS OF PESTICIDES

Objective To expand information on the behaviour of various species of wild birds with respect to ingestion of granular pesticides as food, and to produce statistics contrasting the relative response of small passerine species to dosages of various granular pesticides.

Description Laboratory tests will demonstrate wild bird response to granular pesticides; field tests will be conducted with granular pesticides and an aluminum powder tracer to determine ingestion behaviour in natural habitat. Possible further tests to explore harmfulness of pesticides, if ingestion is observed to occur widely.

Duration Not specified

Commentary A research grant to York University, Department of Biology, Dr. C. D. Fowle, funded by the Pesticides Control Service (Specific Budgetary Program - Air and Land Pollution Control: Pesticide Control)

Budget \$3,000 (1973/74)

Report None as yet

Supervision Pesticide Advisory Committee

REDUCTION OF HERBICIDAL DRIFT IN ROADSIDE SPRAYING

Objective To generate comparative data on the effectiveness of herbicide sprays whose physical properties have been altered (particulation, emulsification, etc.) for the purpose of reducing spray drift.

Description A minimum of ten drift control materials will be used in combination with standard 2, 4-D herbicide, and applied in the field by a roadside spraying vehicle. Drift will be measured fluoremetrically, by bioassay of growth inhibition and by gas liquid chromatography. Meteorological and droplet size factors will be correlated with the drift results.

Duration One year (1973/74)

Commentary A research grant to the University of Guelph, OAC, Department on Environmental biology, Dr. G. R. Stephenson, funded by Pesticides Control Service (Specific Budgetary Program - Air and Land Pollution Control: Pesticides Control)

Budget \$8,000 (1973/74)

Report None as yet

Supervision Pesticides Advisory Committee

REGISTRATION OF COMPOUNDS FOR THE CONTROL OF CUTWORMS ON
HORTICULTURAL CROPS GROWN ON MINERAL SOILS

Objective To test cutworm control pesticides (alternatives to DDT) which prove effective on subterranean feeding species, so as to prove them registrable for general use on horticultural crops grown on mineral soils.

Description Maintenance of field plots, May to September, 1973. Collection of efficacy, spray residue and phytotoxicology data of Phosvel and Dursban on dark-sided cutworms (most common problem) with pre- and post-planting field treatments of cucumber, potato, tomato and pepper crops.

Duration Commenced October 1972; indefinite length.

Commentary A research grant to The Ontario Fruit and Vegetable Growers Association, funded by the Pesticides Control Service. The Association's program is also supported by the Federal Department of Agriculture and the Ontario Ministry of Agriculture and Food. (Specific Budgetary Program - Air and Land Pollution Control: Pesticides Control)

Budget \$2,500 (1973/74)

Report None as yet

Supervision Pesticides Advisory Committee

STUDIES OF ORGANO PHOSPHATE PESTICIDE RESIDUE DEPOSITION,
TOWN OF THORNBURY

Objective To determine possible adverse effects of organophosphate orchard spraying in Thornbury. The study answers concerns of residents that heavy spraying in the area might be threatening to health of the inhabitants.

Description Testing of waters of the Beaver River upstream and downstream of Thornbury - Clarksburg. Soil analyses from pesticide equipment loading areas. Exposure of glass plates to apprehend pesticide drift from air blast sprayers. Sampling to commence of effluent from local canning factory, for pesticide residues.

Duration Commenced 1972/73; Site Thornbury
project completion 1974/75

Commentary An in-house research project of the Pesticides Control Service, in co-operation with the Provincial Pesticides Lab, Dr. R. Frank, and the Ministry of Agriculture and Food. (Specific Budgetary Program - Air and Land Pollution Control: Pesticides Control)

Budget Not determined

Report None as yet

Supervision R. E. Moore, Chief, Pesticides Control Service

STUDIES OF THE RATE OF EVAPORATION OF PESTICIDES, PARTICULARLY
DIAZINON AND PARATHION UNDER ONTARIO CLIMATIC CONDITIONS

Objective To improve assessment of transport rates and mechanisms of pesticides in the environment with attention to meteorological variables, leading to suggestion of improved methods of application. To provide a rating of pesticides by tendency to evaporate.

Description Current literature search. Laboratory studies of evaporation rates under mass transfer geometries, including wind tunnel and bubble evaporation systems.

Duration Commenced 1973/74

Commentary A research grant to the University of Toronto, Department of Chemistry and Applied Engineering, Dr. P. McKay, funded by the Pesticides Control Service. (Specific Budgetary Program - Air and Land Pollution Control: Pesticides Control)

Budget \$4,420 (1973/74)

Report None as yet

Supervision Pesticides Advisory Committee

Research Branch

ARTIFICIALLY-INDUCED DESTRATIFICATION OF LAKES

Objective To assess the potential of preventing algal bloom in surface waters by destratifying lakes by aeration.

Description Using techniques described in Research Report W45, relationships between the nutrient content of suspended materials and associated algae of aerated systems are being analyzed, to determine whether aeration is increasing the efficiency of nutrient utilization by phytoplankton under field conditions.

Duration One year (1973/74)

Commentary An in-house research project of the Research Branch, in cooperation with Dr. Brydges, of the Laboratory Branch. (Specific Budgetary Program - Laboratory and Research: Research; Special Studies)

Budget \$2,000

Report parties) Interim Report, March 1974 (compendium of results of cooperating parties)

Supervision Dr. A. E. Christie, Phycologist

BIOLOGICAL CONTROL OF ALGAL BLOOMS

Objective To explore the feasibility of using natural biological mechanisms in conjunction with nutrient discharge control to prevent the formation of algal blooms in surface waters.

Description Following the isolation, identification and culturing of naturally occurring phytoplankton viruses, field testing will be carried out to assess the practicality of using such materials to prevent selected types of algae from assuming bloom concentrations.

Duration Commenced 1973/74; open-ended

Commentary An in-house research project of the Research Branch (Specific Budgetary Program - Laboratory and Research: Research; Special Studies)

Budget \$10,000 (1973/74)

Report Interim report, March 1974

Supervision Dr. A. E. Christie, Phycologist

BIOLOGICAL DE-NITRIFICATION PROCESS

Objective Anticipating imposition of requirements for nitrate removal in sewage treatment plants, this is the first stage in a full-fledged study of nitrate removal processes.

Description Experimental conversion of old plants to facilitate nitrogen removal.

<u>Duration</u>	Formally, 1972	<u>Site</u>	Newmarket - pilot scale
	to 1975; open-ended as a practical prediction.		Brampton - experimental facility

Commentary An in-house research project of the Research Branch, funded through the Canada - Ontario Agreement on the Lower Lakes.

Budget \$33,500 (1972/73); \$24,000 (1973/74)

Report Available October, 1973

Supervision S. A. Black, Supervisor, Nutrient Removal and Special Studies

CARBON ADSORPTION WASTE TREATMENT

Objective To distinguish between three possible methods of employing activated carbon in waste treatment, with a view to removing dissolved substances.

Description The three methods are:
(1) powdered carbon to primary clarifier;
(2) powdered carbon to aeration section;
(3) granular carbon beds following secondary treatment.

Duration April, 1972 to 1975

Commentary An in-house research project of the Research Branch, funded through the Canada - Ontario Agreement on the Lower Lakes.

Budget \$77,000 (1972/73); \$32,000 (1973/74)

Report June, 1975

Supervision P. D. Foley, Supervisor, Technical Advisory Services

CENTRIFUGATION OF SEWAGE

Objective To evaluate centrifugation as an alternative to settling basins for primary sewage treatment.

Description A comparison of effluent from a centrifuge , fed raw sewage, with conventional process sedimentational effluent.

Duration April, 1972 to April, 1974

Commentary An in-house research project of the Research Branch.
(Specific Budgetary Program - Laboratory and Research: Research;
Applied Sciences)

Budget 22 man-hours, \$5,000 capital

Report To be prepared upon completion

Supervision M. B. Fielding, Supervisor, Applied Sciences

CHARACTERIZATION OF FILAMENTOUS BACTERIA

Objective To determine the nature of bacteria which resist settling in treatment process.

Description Studies are being carried out using model activated sludge plants to determine the growth characteristics of nuisance filamentous bacteria.

Duration One year (1973/74)

Commentary An in-house research project of the Research Branch, with informal cooperation from the Canada Center for Inland Waters. (Specific Budgetary Program - Laboratory and Research: Research; Special Studies, Nutrient Removal)

Budget 200 man-hours total

Report To be prepared upon completion

Supervision S.A. Black, Supervisor, Nutrient Removal and Special Studies; A. Smith

CHEMICAL PROCESS CRITERIA FOR PHOSPHORUS REMOVAL

Objective To develop phosphorus removal techniques suitable for consolidation with each sewage treatment process currently used in Ontario, with a view to meeting the government directive that all plants discharging into Lake Erie, and into most of the inland recreational lakes, incorporate phosphorus treatment processes by the end of 1973.

Description

- (1) Effect of Fe Cl on anaerobic digestion - Sarnia
- (2) Effect of aluminum on an area lagoon - Grimsby
- (3) Fe Cl to primary raw sewage - Barrie
- (4) Fe Cl to an aerobic digester
- (5) Fe Cl to raw activated sludge - Chatham
- (6) Fe Cl to aeration of activated sludge - Chatham
- (7) Aluminum to an oxidation ditch - Port Elgin
- (8) Fe Cl to an oxidation ditch - Port Elgin
- (9) Aluminum to a contact stabilization plant - Picton
- (10) Fe Cl to a contact stabilization plant - Picton
- (11) Dry lime to raw activated sludge - Ingersoll
- (12) Nutrient removal alum to an activated sludge plant - Barrie
- (13) Alum to a seasonal retention waste stabilization pond - Port Arthur
- (14) Alum to a soft water area activated sludge plant - North Bay
- (15) Lime to a seasonal retention waste stabilization pond - Tottenham
- (16) Fe Cl to a seasonal retention waste stabilization pond - Sutton
- (17) Aluminum to a seasonal retention waste stabilization pond - Shelburne

Duration 1971 to April, 1973

Commentary An in-house research project of the Research Branch.
(Specific Budgetary Program - Laboratory and Research: Research;
Technical Advisory Services)

Budget \$90,000 total to date ; \$60,000 (1973/74)

Report To be published during 1973; report on sewage lagoon
batch treatment process will appear separately.

Supervision P.D. Foley, Supervisor, Technical Advisory Services

CHEMICAL TREATMENT OF SEWAGE LAGOONS

Objective To explore chemical treatment of sewage lagoons for removal of nutrients and destruction of bacteria.

Description Batch treatments done with approximately 15 different chemical combinations, in the field.

<u>Duration</u>	1971 to 1974	<u>Sites</u>	Arthur, Tavistock, Aylmer Listowel, Sutton, Toddenham, Beaverton, Chelmsford, Bala Bay
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Commentary An in-house research project of the Research Branch, funded through the Canada-Ontario Agreement on the Lower Lakes (Specific Budgetary Program - Laboratory and Research: Research; Special Studies, Nutrient Removal).

Budget \$5,000 (1972/73); \$20,000 (1973/74).

Report Anticipated in Autumn, 1973

Contact S. A. Black, Supervisor, Nutrient Removal & Special Studies
R. Hunsinger.

COLOUR REMOVAL FROM POTABLE WATER

Objective To reduce solids generated in producing potable water supply. To develop a treatment process which will remove colour satisfactorily, will require minimum supervision, and will lend itself to application in small water treatment plants.

Description Evaluation in the field of processes developed in laboratory, including oxidation reactions, adsorption onto carbon, and enhanced bacteriological consumption of colour-producing substances.

Duration 1973 - one year Site Timmins - specific application to brackish waters on Northern Ontario

Commentary An in-house research project of the Research Branch. (Specific Budgetary Program - Laboratory and Research: Research; Technical Advisory Services)

Budget \$6,000 salary, \$3,000 capital

Report To be produced when project completed.

Supervision P. D. Foley, Supervisor, Technical Advisory Services

COMPARISON OF SUITABILITY OF VARIOUS VEHICLE TYPES FOR APPLYING SEWAGE SLUDGE TO LAND

<u>Objective</u>	To find the best type of vehicle for this purpose.
<u>Description</u>	Research acts as a co-ordinating supervisor of the project.
<u>Duration</u>	1973 to March 1975
<u>Commentary</u>	A contract to the regional municipality of Niagara, funded through the Canada-Ontario Agreement on the Lower Lakes. The Special Studies Section is charged with supervising this project. (Specific Budgetary Program - Laboratory and Research: Research; Nutrient Removal, Special Studies)
<u>Budget</u>	\$15,000 - \$20,000 (1973/74)
<u>Report</u>	Interim report anticipated, October 1973
<u>Supervision</u>	S. A. Black, Project Leader, Advanced Treatment

EFFICIENCY OF CHLORINE DISINFECTION IN SEWAGE TREATMENT PLANTS

<u>Objective</u>	To determine causes of intermittent failure of the chlorination process in the destruction of bacteria in sewage plant effluents. To examine post-chlorination revival of bacteria.
<u>Description</u>	(1) On-site chlorine residual tests (2) Collection of selective samples for bacterial analyses (3) Tracer test to determine mixing patterns in chlorine contact basins.
<u>Duration</u>	Open-ended
<u>Commentary</u>	An in-house research project of the Research Branch. The problem was originally discovered by the Technical Advisory Services Section of the Research Branch; all routine analyses (bacterial, chemical) are done by Laboratory Branch. Project is being carried out at plants operated by Projects Operations Branch. (Specific Budgetary Program - Laboratory and Research: Research; Applied Sciences.)
<u>Budget</u>	One research plus technician, 25% of time
<u>Supervision</u>	A. Oda, Senior Engineer, Applied Sciences

EFFLUENT POLISHING

Objective To make improvements in sewage effluent quality, on all parameters, by adding processes removing solids as well as phosphorus compounds.

Description Experimentation with addition of primary coagulants, coagulant aids and filter aids prior to filtration.

Duration April, 1972 to March 1975

Commentary An in-house research project of the Research Branch, funded through the Canada-Ontario Agreement on the Lower Lakes. (Specific Budgetary Program - Laboratory and Research: Research; Technical Advisory Services)

Budget \$42,100 (1972/73); \$32,800 (1973/74).

Report March, 1975

Supervision P. D. Foley, Supervisor, Technical Advisory Services

EUTROPHICATION REVERSAL PROCESS

Objective To discover methods of removal of algae and nutrients from eutrophied water bodies.

Description Study in early stages; no final enumeration of treatments to be applied.

Duration Commenced 1970, continuing study

Commentary An in-house research project of the Research Branch. (Specific Budgetary Program - Laboratory and Research: Research; Special Studies, Nutrient Removal)

Budget \$3,000 - \$4,000 to date; total commitment uncertain

Report No formal report

Supervision S. A. Black, Supervisor, Nutrient Removal & Special Studies

EVALUATION OF EFFECT OF NUTRIENT REMOVAL ON STREAM-POND SYSTEM

Objective To monitor the impact of a phosphorus - removal plant on water quality in an entire stream - pond system. To test a new style of phosphorus removal "package plant".

Duration Commenced 1970/71; Site Maple
Completed July, 1973

Commentary An in-house research project by the Research Branch in co-operation with the Ministry of Natural Resources (Specific Budgetary Program - Laboratory and Research: Research; Special Studies, Nutrient Removal)

Budget 600 man-hours; \$10,000 capital

Report To be written

Supervision S. A. Black, Supervisor, Nutrient Removal

EVALUATION OF A SMALL CHLORINATOR FOR LOW-VOLUME ISOLATED OPERATIONS

Objective To evaluate performance and disinfecting efficiency of a proprietary device developed for chlorinating small volumes of sewage effluents from package type of sewage treatment plants.

Description The chlorinator was installed as a pilot plant at three different sewage plants to treat small volumes of sewage effluents. Some on-the-site tests were conducted as well as routine sampling of bacterial and chemical analysis. Some work was also performed in the laboratory to check and test the quality of chemicals used in conjunction with the above device.

Duration Commenced September, 1971. Field and lab testing completed by June, 1972, report by September, 1972. No further study contemplated unless by request from another Branch of the Ministry.

Commentary An in-house research project of the Research Branch by request of the Sanitary Engineering Branch. (Specific Budgetary Program - Laboratory and Research: Research; Applied Sciences)

Budget 650 man-hours

Report Evaluation of Sanuril Wastewater Chlorinator, R.P.2038

Supervision A. Oda, Senior Engineer, Applied Sciences

EVALUATION OF TURBIDIMETRY AS A TECHNIQUE FOR MEASURING SUSPENDED SOLIDS IN
SEWAGE EFFLUENTS

Objective To evaluate the adaptability of turbidity measurements based on light reflection to the monitoring of suspended solid content in sewage effluent.

Description A comparison of turbidity readings, to suspended solid weight in individual effluent samples.

Duration Commenced, June 1972; projected completion, March, 1974.

Commentary An in-house research project of the Research Branch (Specific Budgetary Program - Laboratory and Research: Research; Technical Advisory Services)

Budget \$5,000 (salary)

Report Being prepared for publication

Supervision P. D. Foley, Supervisor, Technical Advisory Services

AN EXAMINATION OF SEWAGE AND SEWAGE SLUDGE FOR ENTEROVIRUSES

Objective To ascertain the health hazard with respect to viruses which may be associated with sewage and sewage sludge disposal.

Description A program of testing raw sewage, sewage effluent, and water, draining from land on which sewage sludges are spread, for presence of enteroviruses.

Duration Commenced September, 1972; to be completed April 1974

Commentary An in-house research project of the Research Branch, funded through the Canada-Ontario Agreement on the Lower Lakes. The Ministry of Health is co-operating in this project. (Specific Budgetary Program - Laboratory and Research: Research; Technical Advisory Services)

Budget \$13,000 (1972/73); \$11,000 (1973/74)

Report Final Report April 1974

Supervision P. D. Foley, Supervisor, Technical Advisory Services, Mrs. A. Vajdic, Microbiologist.

EXPERIMENTAL SHALLOW-PIPELINE WATER TEMPERATURE MONITORING

Objective To determine whether a styrofoam barrier between pipe and soil surface will prevent freezing when pipeline is not laid below frost line.

Description Temperature inside an experimental section of watermain and surrounding soils is monitored automatically. Charts analyzed by Research Branch staff.

Duration January 1973 to August 1975 Site Blizzard Valley .

Commentary An in-house research project of the Research Branch by referral from the Project Construction Branch. (Specific Budgetary Program - Laboratory and Research: Research; Applied Sciences)

Budget \$10,000 (monitoring equipment)

Report To be prepared upon completion of project.

Supervision M. B. Fielding, Supervisor, Applied Sciences

FRAZIL ICE STUDY

Objective To predict the likelihood of occurrence of frazil ice in water treatment plant intakes.

Description A statistical review of historical data on occurrence of the ice formations, with special attention to isolation of high risk design characteristics.

Duration Open-ended, consultative program.

Commentary An in-house research project of the Research Branch. (Specific Budgetary Program - Laboratory and Research: Research; Applied Sciences)

Budget 1000 man hours so far.

Report Available - No. W43

Supervision M. B. Fielding, Supervisor, Applied Sciences

HEAVY METALS IN AGRICULTURAL LANDS RECEIVING CHEMICAL SEWAGE SLUDGES

Objective Anticipates disposal demands for chemical sludges when chemical treatment processes proliferate.

Description Investigation of transport of heavy metals from sludge disposal sites, through ground water percolation, surface water runoff, and vegetation. Provision of samples from various phosphorus removal facilities, as well as conventional plants.

Duration 1972 to March, 1975

Commentary A contract to the University of Toronto, Dr. Van Loon, funded through the Canada-Ontario Agreement on the Lower Lakes. The Special Studies Section provides samples for the study and serves the liaison function. (Specific Budgetary Program - Laboratory and Research: Research; Nutrient Removal, Special Studies).

Budget \$15,000 (1972/73); \$10,000 (1973/74)

Report 1972/73 year end report

Supervision S. A. Black, Supervisor, Nutrient Removal & Special Studies

INVESTIGATION OF BACTERIOLOGICAL POPULATION OF WATER DISTRIBUTION SYSTEMS

Objective To ensure acceptable standards of algae control and disinfection inside potable water conduits.

Description Identification of organisms removed from water pipes by foam swabbing; analysis of response to current disinfection techniques.

Duration Commenced 1973; open-ended

Commentary An in-house research project of the Research Branch (Specific Budgetary Program - Laboratory and Research: Research; Technical Advisory Services)

Budget Indefinite

Report None as yet

Supervision P. D. Foley, Supervisor, Technical Advisory Services

INVESTIGATION OF THE PHYSICAL - CHEMICAL SEWAGE TREATMENT PROCESS

Objective To investigate the partial to complete treatment of sewage by physical/chemical processes, as an alternative to biological treatment.

Description After primary treatment, chemicals are added to the water for phosphorus removal; sand filtration follows (for solids removal), and then a carbon adsorption process (organics removal). Beginning on a pilot plant scale, the program will be applied in a full plant operation at the Point Edward plant, (Sarnia).

<u>Duration</u>	Commenced April 1972, to continue until at least 1975	<u>Site</u>	The Point Edward plant (Sarnia)
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Commentary An in-house research project of the Research Branch, funded through the Canada-Ontario Agreement of the Lower Lakes. (Specific Budgetary Program - Laboratory and Research: Research; Special Studies, Nutrient Removal).

Budget \$52,000 (1972/73); \$41,000 (1973/74), (salaries included).

Report Forthcoming October, 1973

Supervision S. A. Black, Supervisor, Nutrient Removal & Special Studies,
W. Lewandowski

INVESTIGATION OF RAINFALL-TILE FLOW CORRELATION

Objective To provide data for municipal decisions on advisability of conducting rainfall run-off through storm sewers.

Description First phase (complete) - investigate opportunity sites. Second phase - explore and implement design housing.

Duration April 1970 to March 1975

Commentary An in-house research project of the Research Branch originally requested by the Municipal Engineers Association through the Ministry of the Environment, Municipal Engineers Committee. Ontario Housing Commission will provide experimental units for the second phase. (Specific Budgetary Program - Laboratory and Research: Research; Applied Sciences)

Budget 200 man-hours/year; \$3,000 capital

Report Available - No. 2033 (Phase I)

Supervision M. B. Fielding, Supervisor, Applied Sciences

LAND DISPOSAL OF SEWAGE AND SEWAGE EFFLUENT

Objective To explore the feasibility of irrigating agricultural lands by applying sewage effluent, in a temperate but seasonal climate with moderate rainfall. Secondary application to seepage from sewage lagoons.

Description (1) Effluent is applied by surface spraying, and by sub-surface injection; ground water monitored for bacterial and viral survival and transport. Airborne transmission of pathogenic elements examined.

(2) Determination of maximum rates of application for given soil types.

(3) Determination of quality of effluent which will prevent infiltration when sprayed on various soil types.

(4) Development of a model (pilot plant - physical) to be used by consultants for pre-design studies.

<u>Duration</u>	1971 to 1975 (3 year per site)	<u>Sites</u>	Smithville (surface run-off Unionville (injection) Port Rowan (pilot model)
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Commentary An in-house research project of the Research Branch funded partially through the Canada-Ontario Agreement of the Lower Lakes and partially by the Research Branch. (Specific Budgetary Program - Laboratory and Research: Research; Applied Sciences)

Budget Total - 8,000 man-hours; \$25,000 total cost of in-house activities by Research Branch.

Supervision M. B. Fielding, Supervisor, Applied Sciences

LAND DISPOSAL OF SEWAGE SLUDGE

Objective To determine the possible adverse effects on soil and crops, of sewage sludge applied to agricultural land.

Description Research Branch in a liaison role, provides samples, materials and technical advice. The investigation itself is conducted at Guelph University. Variables measured include heavy metals, nutrients and microbiological forms.

Duration Commenced 1971; projected completion, March 1975

Commentary A contract to the University of Guelph, Professor Bates, funded through the Canada-Ontario Agreement on the Lower Lakes. (Specific Budgetary Program - Laboratory and Research: Research; Special Studies, Nutrient Removal)

Budget \$50,000 (1972/73); \$125,000 + \$30,000 (1973/74)
(final figure of \$30,000 not yet approved)

Report (1) Literature survey (2) 1972/73 year end report.

Supervision S. A. Black, Project Leader, Advanced Treatment.

MUNICIPAL SEWAGE BY-PASS FLOWS

Objective To generate sewage treatment plant designs which will provide adequately for "peak flows".

Description Present practice is to by-pass the sewage treatment plant during periods of excess flow. The by-passed flow is not metered. This program is designed to meter by-passed flows, and thereby to establish true current peak design plant flow rates.

Duration 1973 to 1975

Commentary An in-house research project of the Research Branch, funded through the Canada-Ontario Agreement on the Lower Lakes. (Specific Budgetary Program - Laboratory and Research; Research; Technical Advisory Services)

Budget \$43,000 (1973/74)

Report None as yet

Supervision P. D. Foley, Supervisor, Technical Advisory Services

OIL SPILL CONTROLS AND CLEAN-UP

Objective To test various chemical agents for oil spill removal. To perfect standardized test procedures so that all oil treating agents can be uniformly evaluated without elaborate procedures.

Description Factors studies include relative effectiveness of each oil treating agent on various types of oil, effects of agents on water quality, toxicity of the agents to fish and aquatic life.

Duration Open-ended. The development of testing procedures is completed, continuing activity involves applying tests to new products introduced to the market.

Commentary An in-house research project of the Research Branch. The Canadian Center for Inland Waters, Emergency Services Branch, conducts a co-operative testing program for sorbent materials under simulated field conditions. (Specific Budgetary Program - Laboratory and Research: Research; Applied Sciences)

Budget 3,000 man-hours, \$5,000 capital (total project value)

Supervision A. Oda, Senior Engineer, Applied Sciences

PHYSICAL - CHEMICAL WATER TREATMENT PLANT

Objective To improve water supply treatment procedures.

Description (1) To determine optimum juncture for addition of ferrous sulphate in the activated sludge process.

(2) To investigate the applicability of an activated carbon (fly ash) treatment to effect carbon removal from waste treatment plant effluent, as compared to the use of activated carbon.

Duration (1) Commenced 1972; to be completed end of 1973
(2) Commenced 1973; open-ended

Commentary An in-house research project of the Research Branch. (Specific Budgetary Program - Laboratory and Research: Research; Special Studies, Nutrient Removal)

Budget (1) 400 man-hours,
(2) 600 man-hours per annum.

Report No formal report yet.

Supervision S. A. Black, Supervisor, Nutrient Removal, W. Lewandowski

PHYTOPLANKTON - NUTRIENT RELATIONSHIPS ON ONTARIO SURFACE WATERS

Objective To establish suitable criteria for nutrient levels in treated sewage effluent as they affect algae growth in both hard and soft surface waters.

Description Preliminary limnological assessment of natural nutrient-phytoplankton relationships in waters of various trophic classes was examined. Controlled laboratory and field experiments were then initiated to clarify interrelationships between phytoplankton responses and the availability of various major and trace nutrient materials typically associated with sewage effluents.

Duration From 1967; open-ended

Commentary An in-house research project of the Research Branch. (Specific Budgetary Program - Laboratory and Research: Research; Special Studies)

Budget \$20,000 per annum

Report Publications infra:

Christie, A. E., 1968, Nutrient-Phytoplankton Relationships in Eight Southern Ontario Lakes, O.W.R.C. Research Report No. 32

Christie, A. E., 1969, Trisodium Nitroacetate and Algae. O.W.R.C. Research Paper No. 2023

Christie, A. E., 1969, In Vitro Responses of Soft Water Algae to Fertilization. O.W.R.C. Research Paper No. 2024

Christie, A. E., 1969, Phytoplankton Populations in Several Ice-Covered Lakes of Southern Ontario. O.W.R.C. Research Paper No. 2025

Harris, A. J., Roberts, K. J., and Christie, A. E., 1971, "Effects of Detergents on Water Supplies." Jour. Amer. Water Works Assoc. 63: 795-799

Christie, A. E., 1973, Phytoplankton Studies in the Bay of Quinte: I - Physical, Chemical and Phytoplankton Characteristics. Ontario Ministry of the Environment, Research Report W44.

Christie, A. E., 1973, Phytoplankton Studies in the Bay of Quinte: II - Relationships Between Seston - Phosphorus, Nitrogen, Carbon and Phytoplankton. Ontario Ministry of the Environment, Research Report W45

Christie, A. E., 1973, Seston Carbon, Nitrogen, Phosphorus and Phytoplankton From Eight Southern Ontario Lakes. Ontario Ministry of the Environment, Research Report W46

Christie, A. E., (in prep.) Nutrient Enrichment Studies in a Marl Lake: Lake-on-the-Mountain, Prince Edward Country.

Christie, A. E., (in prep.) Fertilization Studies in a Precambrian Shield Lake: Kushog Lake, Haliburton County.

Supervision A. E. Christie, Phycologist

PLASTIC SEWER PIPE ASSESSMENT

Objective To provide data for Ministerial regulations on design criteria for buried plastic sewer pipes.

Description Theoretical evaluation of pipe-soil interaction supported by laboratory pipe testing.

Duration Open-ended function

Commentary An in-house research project of the Research Branch. (Specific Budgetary Program - Laboratory and Research: Research; Applied Sciences)

Budget 1,000 man-hours; no capital outlay

Report Available - No. 2036

Supervision M. B. Fielding, Supervisor, Applied Sciences.

PROBLEM IDENTIFICATION AT SEWAGE TREATMENT PLANTS

Objective To determine design modifications advisable in future plant engineering.

Description Exploration of problems as they arise; characterization of design defects related to specific recurrent problems.

Duration March 1973 to March 1974

Commentary An in-house research project of the Research Branch, funded through the Canada - Ontario Agreement on the Lower Lakes.

Budget \$15,000 (1973/74)

Report None as yet

Supervision P. D. Foley, Supervisor, Technical Advisory Services

REVERSE OSMOSIS WASTEWATER TREATMENT PROCESS

Objective To determine advantages and disadvantages of purifying waste water beyond current Ministerial standards of acceptability.

Description Compare costs of further purifying wastes by processes producing a saleable by-product, to those of accelerating anaerobic bacterial digestion by heating (no by-product produced). Cheese whey is current experimental waste medium. Additional potential applications - water softening for gypsum rock wells; producing sodium - free potable water for specialized medical problems.

Duration 3 years (April 1972 to April 1975)

Commentary An in-house research project of the Research Branch, by reference from the Industrial Wastes Branch. Additional applications will also relate to responsibilities of the Sanitary Engineering Branch. (Specific Budgetary Program - Laboratory and Research: Research; Applied Sciences)

Budget \$20,000 per annum (3,000 man-hours, \$2,000 capital).

Report To be prepared upon completion of project.

Supervision M. B. Fielding, Supervisor, Applied Sciences.

SEQUESTERING OF IRON AND MANGANESE FROM WATER SUPPLY

Objective To standardize a process which will satisfy Ministry objectives for colour in water supplies (0.3 parts per million - iron; .05 parts per million - manganese).

Description Application of a silicate in treatment process

Duration Developmental task completed 1970; consultative role on applications anticipated to continue to 1975.

Commentary An in-house research project of the Research Branch (Specific Budgetary Program - Laboratory and Research: Research; Technical Advisory Services)

Budget \$6,000 per annum (approximately).

Report Published Journal of American Waterworks Association

Supervision P. D. Foley, Supervisor, Technical Advisory Services

SEWAGE SLUDGE DISPOSAL: HEAVY METAL TRANSPORT TO GROUND WATER, AGRICULTURAL LANDS

Objective To investigate the uptake of heavy metals by crops and transport of heavy metals and nutrients through soil from the application of sludge to agricultural land.

Description Lysimeter measurement under both field and laboratory conditions, of heavy metal transport in ground water when sewage sludge is applied to agricultural lands. Absorption of heavy metals into crops also monitored.

Duration Commenced, 1972; open-ended Sites Maple - greenhouse control
Newmarket - field application

Commentary An in-house research project of the Research Branch (Specific Budgetary Program - Laboratory and Research: Research; Special Studies, Nutrient Removal)

Budget 1½ man-years per annum

Report Paper presented in Ottawa, October 2, 1973

Supervision S. A. Black, Supervisor, Nutrient Removal and Special Studies

SEWAGE TREATMENT BY GAMMA IRRADIATION

Objective To investigate the application of gamma irradiation on a pilot scale to conventional secondary sewage effluent.

Description Monitoring of secondary sewage effluent at a conventional plant, both before and after exposure to gamma irradiation in a pilot irradiator. Parameters monitored in the effluents included indicator and pathogenic bacteria, viruses, COD, BOD, phosphates, solids, nitrogen.

Duration Commenced August, 1972; to be completed by the end of 1973

Commentary An in-house research project of the Research Branch, with the co-operation of Atomic Energy of Canada Limited, Geodel Incorporated, and McMaster University. (Specific Budgetary Program - Laboratory and Research: Research; Technical Advisory Services)

Budget Salaries for one microbiologist, 6% of the time, and one technician, 6% of the time.

Report Final report, end of 1973

Supervision P. D. Foley, Supervisor, Technical Advisory Services, Mrs. A. Vajdic, Microbiologist.

SEWAGE TREATMENT PLANT ODOUR CONTROL

Objective To apply engineering technology for odour control in sewage plant operations.

Description Investigations relate to individual plants as problems arise.

Duration Open-ended

Commentary An in-house research project of the Research Branch with the co-operation of the Air Management Branch. (Specific Budgetary Program - Laboratory and Research: research; Applied Sciences)

Budget 500 man-hours to date

Report Internal progress report

Supervision M. B. Fielding, Supervisor, Applied Science

SMALL-SCALE CARBON REGENERATION STUDIES

Objective To determine the feasibility of recovering carbon used in the waste treatment process, on a small scale, exploring the variety of methods of regeneration.

Description Evaluation has indicated that only one regeneration process is economical at a small scale. The smallest full size furnace will be operated.

Duration Commenced April, 1973; to 1976.

Commentary An in-house research project of the Research Branch, funded through the Canada-Ontario Agreement on the Lower Lakes. (Specific Budgetary Program - Laboratory and Research: Research; Technical Advisory Services)

Budget \$85,000 (1973/74)

Report None as yet

Supervision P. D. Foley, Supervisor, Technical Advisory Services

STORM WATER TREATMENT

Objective To discover methods of treating storm water adequately without applying full sewage disinfection process.

Description Self-cleaning rotating screens, tested on site.

Site Belleville

Commentary An in-house research project of the Research Branch, funded through the Canada-Ontario Agreement on the Lower Lakes. (Specific Budgetary Program - Laboratory and Research: Research; Technical Advisory Services)

Budget \$13,400 (1972/73); \$63,000 (1973/74)

Report June 1974.

Supervision P. D. Foley, Supervisor, Technical Advisory Services

A STUDY OF HEPATITIS OCCURRENCE RATE IN A WATER TREATMENT PLANT

Objective Exploration of possible reasons for the occurrence of hepatitis in a particular Ottawa water treatment plant.

Description Concentration of samples of raw water (before treatment), water plant sludge, and final treated water, preparatory to isolation of the hepatitis virus by the Ministry of Health. Control samples are being collected from a Brantford plant.

Duration Commenced May, 1973; open-ended

Commentary An in-house research project of the Research Branch, funded through the Canada-Ontario Agreement on the Lower Lakes. The program was initiated through Sanitary Engineering Branch on the request of the Ottawa Medical Officer of Health. (Specific Budgetary Program - Laboratory and Research: Research; Technical Advisory Services)

Budget One microbiologist, 40% of time.

Report Interim report, August, 1973

Supervision P. D. Foley, Supervisor, Technical Advisory Services, Mrs. A. Vajdic, Microbiologist

TASTE AND ODOUR REMOVAL - POTABLE WATER SUPPLY

Objective Immediate - to identify the nature of problem-generating substance (primarily algal, sometimes heavy metals). Long-term - to evaluate specific species of algae in exposure to all the known forms of water treatment, and to anticipate peaking periods of algal bloom.

Description Test effects of sediment action and filtration on removal of algae and their taste/odours.

Duration Commenced 1968, open-ended.

Commentary An in-house research project of the Research Branch by referral from individual municipalities as problems arise. (Specific Budgetary Program - Laboratory and Research: Research; Technical Advisory Services).

Budget Average \$6,000 per annum (salaries), depending on rate of problem occurrence.

Report No

Supervision P. D. Foley, Supervisor, Technical Advisory Services.

THERMOPHILIC ANAEROBIC DIGESTION

Objective To enhance the effects of a digester by maintaining a higher operating temperature; and to determine the effects of the new chemical sludges on the digestion process.

\ Description Operation of a conventional digester at an elevated operating temperature of 120° to 130°F.

Duration April, 1973 to September 1975

Commentary An in-house research project of the Research Branch, funded through the Canada-Ontario Agreement on the Lower Lakes. (Specific Budgetary Program - Laboratory and Research: Research; Technical Advisory Services)

Budget \$36,000 (1973/74), mainly representing initial capital expenditure

Report January, 1976

Supervision P. D. Foley, Supervisor, Technical Advisory Services

WATER TREATMENT BY DIRECT FILTRATION

Objective To provide alternative water treatment process which will lower plant construction costs and reduce the amount of sludge produced.

Description Experimentation with a direct filtration process which would eliminate the need for sedimentation.

Duration Commenced, April, 1971;
Projected completion, December 1973

Site Sarnia - applicable generally to the Great Lakes.

Commentary An in-house research project of the Research Branch, on the referral of the Project Operations and Sanitary Engineering Branches of the Ministry of the Environment. (Specific Budgetary Program - Laboratory and Research: Research; Technical Advisory Services).

Budget \$18,000 salary, \$3,000 Capital (1972/73)

Report Published, Journal of American Waterworks Association.

Supervision P. D. Foley, Supervisor, Technical Advisory Services

WATER TREATMENT PROBLEMS OF ALGAL ORIGIN

Objective To assist in resolution of water treatment problems with respect to taste, odour and filter-clogging associated with algae.

Description To provide a support function within the Research Branch to engineers involved in water treatment research, by identifying algae and supplying cultures of selected phytoplankton to assist in the development of treatment methods for the removal of taste, odour and filter-clogging problems of water treatment.

Duration From 1965, open-ended

Commentary An in-house research project of the Research Branch. (Specific Budgetary Program - Laboratory and Research: Research; Special Studies)

Budget \$1,000 or less per annum

Report No

Supervision Dr. A. E. Christie, Phycologist

Laboratory Branch

ANALYSIS OF DISSOLVED SOLIDS FOR ACCURACY AT LOW LEVELS

Objective To determine of procedures can be adopted to give reliable results at low levels. Routine quality control results will also be used to define concentration ranges where data will be reliable.

Duration New procedure to be ready by February, 1974.

Commentary An in-house project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory; Chemistry I Section)

Supervision C.E. Simpson, Supervisor, Chemistry I Section

ANALYSIS FOR SELENIUM IN WATER, SEDIMENTS, AND BIOLOGICAL MATERIAL

Objective To develop and evaluate methods of extreme sensitivity for selenium analysis in rocks, water and biological material.

Description Levels in fish, geological variation and ratios of selenium to other metals will be studied.

Duration Ongoing to April, 1973

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory;
Chemistry II (Inorganic))

Report Prepared August, 1973

Supervision P.L. Diosady, Supervisor, Chemistry II Section

ANALYTICAL METHODOLOGY FOR DETECTION OF PESTICIDE RESIDUES,
METABOLITES, DEGRADATION PRODUCTS

Objective To develop methods of analysis for biological control agents, their metabolites and degradation products, in order to supply analytical support for the Biology and other Ministry of the Environment Branches.

Description (1) Review and extend methodology for analysis of organochloride insecticides.
(2) Develop analytical methodology for organophosphate insecticides and their metabolites and degradation products.
(3) Review and further develop methodology for analysis of triazine herbicides.
(4) Review and further develop methodology for the analysis of 2,4,D.-type herbicides.
(5) Develop methodology for analysis of carbamate and tiocarbamate materials.
(6) Continue development of methodology for analysis of individual biological control agents not in the above categories.

Duration (1) One month; (2) 4 - 6 months; (3) One month
(4) One month; (5) continuing.

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory;
Chemistry II (Organic))

Supervision P.L. Diosady, Supervisor, Chemistry II Section

ANALYTICAL QUALITY CONTROL OF THE GREAT LAKES PROGRAM

Objective To coordinate quality control samples and analytical methods being used on Great Lakes Programs.

Duration Ongoing

Commentary An in-house project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory;
Chemistry I Section)

Supervision C.E. Simpson, Supervisor, Chemistry I Section

ANALYTICAL SUPPORT FOR ENVIRONMENTAL MONITORING INVOLVING
PCB'S (AND SIMILAR COMPOUNDS)

Objective To provide analytical support for environmental monitoring, to determine background levels, "hot spots", and trends for PCB's and related compounds.

Description (1) Upper Great Lakes monitoring - PCB's
(2) Snow Quality Monitoring
(3) General Monitoring for HCB and HCBD
(4) "Hot spots" identification for PCB, PCT, HCB, HCBD.

Duration (1) 3 - 4 years
(2) One year
(3) Ongoing
(4) Ongoing

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory;
Chemistry II (Organic))

Supervision P.L. Diosady, Supervisor, Chemistry II Section

ANION SAMPLE PRESERVATION

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Objective To establish more reliable means of stabilizing samples requiring analysis for sulphide and cyanide by studying various means of sample preservation.

Duration Requires three months, to January, 1974

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory;
Chemistry II Section (Inorganic)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section
(Inorganic)

Objective To assess the feasibility of employing the Analytab system of culture testing as a means of improved identification bacterial isolates.

Duration Expected termination date: March, 1974

Commentary An in-house research project of the Laboratory Branch. (Specific Budgetary Program - Laboratory and Research: Laboratory; Bacteriology Section).

Supervision L. Vlassof, Supervisor, Bacteriology Section

APPLICATION OF ION SELECTIVE ELECTRODES TO DETERMINATION OF ANIONS
IN WATER

Objective To evaluate the use of ion selective electrodes in analyses for: F, Br, Cl, CN, H₂S and sulphite.

Duration On-going, requires twelve months; completion, 1974/75.

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory;
Chemistry II Section (Inorganic)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section

ASSAY OF PSEUDOMONAS AERUGINOSA AND PSEUDOMONAS SP. AS PARAMETERS OF
WATER QUALITY

Objective To make available as a standard parameter the assay for *Pseudomonas aeruginosa* and *Pseudomonas* sp. These organism give information concerning the health quality of bathing waters and the nutrient condition of surface waters.

Duration Expected termination date: April, 1974 and on-going

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory;
Bacteriology Section).

Supervision L. Vlassof, Supervisor, Bacteriology Section

CHEMICAL AND BIOLOGICAL LAKE ANALYSES - SUDBURY ENVIRONMENTAL
STUDY

Objective To determine what effects acid conditions are having on bacterial and fungal populations of Sudbury Lakes, and determine if acidic lakes have relatively more acid-tolerant micro-organisms compared with non-acidic waters. In view of the input of sulphur to these waters, the bacteria involved in the sulphur cycle are being studied to determine their role in sulphur recycling and generation of H_2SO_4 .

Duration Expected termination date: March, 1974

Commentary An in-house research project of the Laboratory Branch. (Specific Budgetary Program - Laboratory and Research: Laboratory; Bacteriology Section).

Supervision L. Vlassof, Supervisor, Bacteriology Section

Objective To investigate the methylating capacity of industrial effluents.

Duration On-going, August 1973; requires six months.

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory;
Chemistry II Section (Mercury Group)).

Report In preparation

Supervision P. L. Diosady, Supervisor, Chemistry II Section

CONFIRMATION OF ACCURACY OF GC IN DETECTING METHYL MERCURY DEVELOPMENT
OF A PYROLYSIS LDC COMBINATION FOR RAPID METHYL MERCURY
DETERMINATION

Objective To confirm that the species measured as methyl mercury by GC is actually methyl mercury. To develop a fast organic mercury method using a pyrolysis preparation technique and determination by means of the LDC monitor.

Duration On-going to mid 1973.

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory;
Chemistry II Section (Mercury Group)).

Report In preparation

Supervision P.L. Diosady, Supervisor, Chemistry II Section.

DETECTION AND ENUMERATION METHODOLOGY FOR SULPHATE-REDUCING
BACTERIAL POPULATIONS

Objective To select a method and medium for easy and rapid detection and counting of populations of sulphate-reducing bacteria in water and sediment.

Duration Expected termination date: November, 1973

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory;
Bacteriology Section).

Supervision L. Vlassof, Supervisor, Bacteriology Section

DETECTION AND ENUMERATION OF PHOSPHATE-SOLUBILIZING BACTERIA

Objective To ascertain the desirable rate of phosphorus recycling in lakes, considering that this rate should be governed to a large extent by the number and activities of organisms capable of releasing phosphorus.

Duration On-going

Commentary An in-house research project of the Laboratory Branch. Specific Budgetary Program - Laboratory and Research: Laboratory; Bacteriology Section).

Supervision L. Vlassof, Supervisor, Bacteriology Section

DETERMINATION OF FREE CARBON IN AIR PARTICULATE

Objective To assay the free carbon content of Ontario atmosphere. (As a nuisance factor, carbon fall-out generates frequent public complaint; as an adsorbent carrier of various gases and compounds, it presents potential dangers to health.

Description Part I: Development of analytical techniques for monitoring carbon content.

 Part II: Survey of free carbon in Ontario urban atmosphere.

 Part III: Determination of particle size distribution of atmospheric free carbon.

Duration Part I: May 1973 to December 1973
 Part II: Open-ended
 Part III: 1 year (April 1973 to April 1974)

Commentary An in-house research project of the Air Quality Laboratory. (Specific Budgetary Program - Laboratory and Research: Air Quality Laboratory; Physical Methods Section).

Budget \$11,500 (Salaries) \$8,000 (capital)

Report Report anticipated in December 1973

Supervision Dr. J. A. Pimenta, Project Leader; A. C. Rayner, Chief, Air Quality Laboratory

DETERMINATION OF PPB LEVELS OF METALS BY ELECTRO-ANALYTICAL TECHNIQUES

Objective To provide methodology for metal analysis by polarography, pulse polarography, and anodic stripping voltammetry. These techniques will be applied to the determination of Cu, Ni, Zn, Pb, and Cd in water.

Duration Will require four months from date of arrival of equipment. Commenced July 2, 1973.

Commentary An in-house research project of the Laboratory Branch. (Specific Budgetary - Laboratory and Research: Laboratory; Chemistry II Section (Inorganic Group)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section.

DETERMINATION OF PPB AND SUB PPB LEVELS OF METALS BY FLAMELESS
AAS (FAAS)

Objective To evaluate various types of equipment using carbon rod analyzers (CRA), and tantalum strip as FAAS metals analyzers.

Duration Four months; completed by January 1964.

Commentary An in-house research project of the Laboratory Branch. (Specific Budgetary Program - Laboratory & Research; Laboratory; Chemistry I Section).

Supervision C. E. Simpson, Supervisor, Chemistry I Section

DEVELOPMENT OF ANALYICAL METHODOLOGY FOR TOTAL MERCURY IN NON-AQUEOUS SOLUTIONS AND BIOTA

Objective To develop reliable means of analyzing insects, plants, alcohol and formaldehyde for mercury.

Description Pyrolysis and FAAS will be investigated.

Duration On-going to mid 1973

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory;
Chemistry II Section (Mercury Group)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section

DEVELOPMENT OF ANALYTICAL METHODS FOR TRACE METALS IN WATER

Objective To provide methodology for reliable determination of Mo, Sn, Au, Bi, Ba, Te, Be, In, and Sr in waters at ppb levels using fluorimetry, AAS and/or colorimetry.

Duration On-going, will be at least a two-year project, continuing into 1975/76.

Commentary An in-house research project of the Laboratory Branch. (Specific Budgetary Program - Laboratory and Research: Laboratory; Chemistry II Section (Inorganic Group)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section

DEVELOPMENT OF FIELD TESTS AND COLLECTION TECHNIQUES FOR
SULPHIDE ANALYSIS

Objective To investigate, for use in the field, tests such as molybdenum blue for sulphide, and Draeger tubes for sulphite and sulphide.

Duration On-going, will last until the end of 1973

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory;
Chemistry II Section (Inorganic Group)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section

DEVELOPMENT OF FIELD TESTS FOR CYANIDE

Objective To develop a rapid, sensitive method for the detection and at least semi- quantitative determination of free cyanide in water and waste water at sub ppm levels.

Duration Requires six to eight month period ; completion early in 1974.

Commentary An in-house research project of the Laboratory Branch. (Specific Budgetary Program - Laboratory and Research: Laboratory; Chemistry II Section (Inorganic)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section

DEVELOPMENT OF RELIABLE METHODS FOR THE DETERMINATION OF A VARIETY
OF ANIONS IN WATER

Objective To provide methods of analysis for halogens (I₂, Br₂, Cl₂), total sulphur and cyanate at trace (ppm to ppb) levels.

Description Colorimetry, ion selective electrodes, and fluorometry will be studied.

Duration Will last eight to ten months; completion mid 1974

Commentary An in-house research project of the Laboratory Branch. (Specific Budgetary Program - Laboratory and Research: Laboratory; Chemistry II Section (Inorganic)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section.

EVALUATION OF CAPABILITY TO PRODUCE HEAVY METALS ANALYSIS IN FISH

Objective To provide capability for analysis of Cu, Ni, Pb, Cd, Zn, Se, As, in fish.

Description Digestion colorimetry, AAs, FAAs, and polarography parameters will be used.

Duration Ongoing, will continue through 1974.

Commentary An in-house research project of the Laboratory Branch (Specific Budgetary Program - Laboratory & Research, Laboratory; Chemistry II (Inorganic))

Supervision P. L. Diosady, Supervisor, Chemistry II Section

EVALUATION OF COMMERCIAL FLUORIDE ELECTRODES

Objective To evaluate commercial fluoride electrodes as alternatives to distillation.

Description Equipment has not been reliable so far and other chemical methods are being considered as alternatives.

Duration A method to replace distillation is hoped for by May, 1974.

Commentary An in-house project of the Laboratory Branch, (Specific Budgetary Program - Laboratory and Research: Laboratory; Chemistry I Section)

Supervision C.E. Simpson, Supervisor, Chemistry I Section

EVALUATION OF THE PRESENCE OF *Acinetobacter* sp. AS A REFLECTION
OF EUTROPHICATION OF LAKES

Objective To determine the usefulness of this bacteriological parameter as a reflection of eutrophication.

Description Previous work carried out by E. Bennett and M. Jones of OWRC from 1968 to 1970 indicated that the population of *Acinetobacter* sp. in surface water reflected the trophic level. Assays for *Acinetobacter* on recreational lakes will be related to chemical and biological indicators.

Duration Ongoing

Commentary An in-house research project of the Laboratory Branch. (Specific Budgetary Program - Laboratory & Research: Laboratory; Bacteriology)

Supervision L. Vlassof, Supervisor, Bacteriology Section

EVALUATION OF RESULTS OF LAKE DESTRATIFICATION

Description Four experiments are presently being carried out to evaluate effects on water quality and fish production, of the destratification technique.

Duration Field work will likely end in 1974.

Commentary An in-house research project of the Laboratory Branch. The Chemistry I Section co-ordinates the work of several Ministry Sections, and that of the Ministry of Natural Resources. (Specific Budgetary Program - Laboratory & Research: Laboratory; Chemistry I Section)

Report Two reports have been completed and several more are planned for the winter of 1973/74.

Supervision C.E. Simpson, Supervisor, Chemistry I Section

EVALUATION OF A SOLVENT EXTRACTION/CONDUCTIMETRIC TECHNIQUE FOR
THE DETERMINATION OF MOISTURE CONTENT OF SEDIMENT AND SOIL SAMPLES

Objective To provide a rapid method for the determination of the moisture content of soil and sediment samples.

Duration First stage completed as of August, 1973.

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory;
Chemistry II (Inorganic))

Report In preparation

Supervision P. L. Diosady, Supervisor, Chemistry II Section

EXAMINATION OF FAULTY SEPTIC TILE FIELDS

Objective To determine the cause and bacteriology of "ponding" in tile fields and movement of sewage bacteria through the soil and ground water.

Duration Ongoing

Commentary An in-house research project of the Laboratory Branch, in conjunction with the Private Waste and Water Management Branch. (Specific Budgetary Program - Laboratory & Research:Laboratory; Bacteriology Section)

Supervision L. Vlassof, Supervisor, Bacteriology Section

FATE OF ETHYL MERCURY IN SEDIMENTS

Objective To determine by means of time-regulated sampling the fate of ethyl mercury in St. Clair sediments.

Duration On-going, to mid 1973. Site: St. Clair River

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory;
Chemistry II Section (Mercury Group)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section.

IDENTIFICATION AND CLASSIFICATION OF POLLUTION INDICATOR BACTERIA
IN WATER DISTRIBUTION SYSTEMS

Objective To establish possible source(s) of pollution in
the system.

Duration Expected termination date: December, 1975

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory;
Bacteriology Section)

Supervision L. Vlassof, Supervisor, Bacteriology Section

IMPACT OF DESTRATIFICATION ON THE BACTERIAL FLORA WITHIN A RESERVOIR ENVIRONMENT

Objective To determine what changes occur in populations of aerobic and anaerobic bacteria when pond conditions become more aerobic from an anoxic state through artificial destratification.

<u>Duration</u>	Expected termination date:	<u>Site</u>	Scotch Block,
	December, 1975		Halton County

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory;
Bacteriology Section).

Supervision L. Vlassof, Supervisor, Bacteriology Section

IMPROVEMENT OF ANALYTICAL METHODOLOGY FOR MERCURY IN WATER,
SEDIMENTS, FISH AND PLANT MATERIAL

Objective To develop more rapid, precise and sensitive methods of analysis of mercury in these media. A study of the effects of drying, seiving and screening for sediments; lyophilization, drying and a variety of digestion techniques for fish; and a number of oxidation reagents and amalgamation techniques for water analysis.

Duration On-going, August, 1973; requires twelve months.

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory;
Chemistry II Section (Mercury Group)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section

IMPROVEMENT OF HEAVY PETROLEUM PRODUCT ANALYSIS

Objective To expand capabilities for heavy petroleum product analysis. To provide definitive analytical evidence for source identification of materials causing taste and odour problems, toxicity and esthetic pollution or requiring court action. The following approaches will be used:

- (1) Gas chromatography using capillary, S.C.O.T. (support coated open tubular) columns, and specific detectors to provide a "sulphur fingerprint"/
- (2) Liquid chromatography for class fingerprints and additive identification.
- (3) Fluorometric identification techniques.
- (4) Identification of oils by trace metal detection and ratio measurements.

Duration

- (1) 1 to 2 months
- (2) 3 months
- (3) 1 month
- (4) 1 month

Commentary An in-house research project of the Laboratory Branch. (Specific Budgetary Program - Laboratory & Research: Laboratory; Chemistry II Section (Inorganic)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section

INVESTIGATION OF THE OCCURRENCE AND DISTRIBUTION OF
POLYNUCLEAR AROMATIC HYDROCARBON COMPOUNDS, ESPECIALLY BENZO (a)
PYRENE, IN AIR

Objective To conduct pilot monitoring programs for polynuclear aromatic hydrocarbons in the field, relating levels of concentration to meteorological, topographical factors, preparatory to selecting Stations for routine analysis.

Description Part I. Monitoring concentration levels of identified compounds in eleven Ontario communities by fluorometric measurement.
Part II. Isolating and identifying other polynuclear hydrocarbons in urban air, with concurrent investigation of methodology for analyzing occurrence of these compounds in High-Volume filter extracts.

Duration Part I. Begin of study - July, 1971; completion expected July 1974
Part II. Begin of study - December 1972; Open-ended

Commentary An in-house research project of the Air Quality Laboratory (Specific Budgetary Program - Laboratory and Research: Air Quality Laboratories; Organic Chemistry Section)

Budget \$14,500 (salaries), \$13,000 (capital)

Report A 60 page Interim Report issued December 1971. A Paper presented at the National Conference of the American Chemical Society in New York, September, 1972. The First Annual Report to be issued in September, 1973.

Supervision E.G. Adamek, Project Leader; A.C. Rayner, Chief, Air Quality Lab

MANGANESE ANALYSIS

Objective To adapt the present iron digestion procedure to give manganese simultaneously on a separate automatic analyser channel.

Duration New method to be in use by October, 1973.

Commentary An in-house project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory; Chemistry I Section)

Supervision C.E. Simpson, Supervisor, Chemistry I SEction

MEDIA DEVELOPMENT FOR COLIFORM CONFIRMATION

Objective Development of media for coliform confirmation and isolation of Clostridium perfringens used to detect fecal pollution.

Duration Expected termination date December, 1974

Commentary An in-house research project of the Laboratory Branch (Specific Budgetary Program - Laboratory & Research: Laboratory; Bacteriology)

Supervision L. Vlassof, Supervisor, Bacteriology Section

MERCURY ANALYSES - ROUND ROBIN SAMPLING

Objective To provide intercalibration data on MOE mercury analyses of fish, sediments, and water samples for total and methyl mercury.

Description This involves considerable calculating, statistics and administrative time.

Duration In progress, August 1973, will continue for at least two years.

Commentary An in-house research project of the Laboratory Branch. (Specific Budgetary Program - Laboratory and Research: Laboratory; Chemistry II Section (Inorganic)).

Report Reported as individual studies completed.

Supervision P. L. Diosady, Supervisor, Chemistry II Section

MERCURY METHYLATION STUDIES OF ST. CLAIR SEDIMENT

Objective To determine rate of methylation of inorganic mercury in sediments under various concentration of mercury and different nutrient levels; to develop a test which will indicate the relative potential for mercury methylation of a sediment; to isolate and identify micro-organisms capable of methylating mercury from St. Clair sediments.

Duration Expected termination dates: August, 1973; October, 1973
and April, 1974

Commentary An in-house research project of the Laboratory Branch. (Specific
Budgetary Program - Laboratory & Research: Laboratory; Bacteriology Section

Supervision L. Vlassof, Supervisor, Bacteriology Section

METHODOLOGY FOR THE ANALYSIS OF INDUSTRIAL CHLORINATED HYDROCARBON RESIDUES

Objective To provide adequate analytical methods for Environmental studies and monitoring for these materials.

Description (1) Further evaluation of PCB/pesticide separations
(2) Method development for hexachlorobenzene (HCB) and hexachlorobutadiene (HCBD).
(3) Method development for chlorinated terphenyls
(4) Method development for chlorinated naphthalenes

Duration (1) 1 month
(2) 2 months
(3) 1 to 2 months
(4) 2 months

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory; Chemistry II Section (ORganic)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section

METHODOLOGY FOR HEAVY METAL ANALYSIS IN PETROLEUM PRODUCTS

Objective To provide methods of analysis and capacity to analyze for Ni, V, Cr, Mo in oils and Pb in gasoline.

Description The conditions required in sample preparation (digestion, ashing, low temperature ashing) will be evaluated.

Duration To start in summer, 1973 and will require (4) four months.

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory;
Chemistry II Section (Inorganic)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section

METHODOLOGY FOR HEAVY METALS ANALYSIS IN PLANT MATTER

Objective To further develop methodology and provide capacity for reliable heavy metal analysis in plants.

Description The study will relate to metals in corn, oats, barley, and other crops grown on sludge-treated land; to mosses and grasses used as cover on tailings areas; and to water plant analyses.

Duration Ongoing into 1974/75

Commentary An in-house research project of the Laboratory Branch. (Specific Budgetary Program - Laboratory & Research: Laboratory; Chemistry II (Inorganic))

Report To be prepared

Supervision P.L. Diosady, Supervisor, Chemistry II Section

METHODOLOGY FOR MEASUREMENT OF FREE CHLORINE

Objective To search the literature and to test field methods for measuring free chlorine.

Duration Literature search is completed, testing to be commenced in October, 1973.

Commentary An in-house project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory; Chemistry I Section)

Supervision C.E. Simpson, Supervisor, Chemistry I Section

METHODS FOR CONCENTRATING LOW LEVELS OF ANIONS TO LEVELS AMENABLE TO ANALYSIS

Objective To study methodology for extraction ion exchange, distillation and co-distillation techniques, for anions.

Duration Projected completion, Spring, 1974

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory;
Chemistry II Section (Inorganic)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section

METHODS OF CONCENTRATION OF HEAVY METALS IN WATER

Objective To provide methodology for concentration of very low levels of metals found in municipal water supplies to ppm level.

Description This will include; ion exchange, solvent extraction, anodic stripping, volatilization, distillation and co-distillation

Duration On-going, will require at least one year.

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory;
Chemistry II Section (Inorganic)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section

METHYLATION OF MERCURY BY MICROBIOLOGICAL MEANS

Objective To evaluate the methylating capacity of micro-organisms on mercury added as various inorganic forms to natural sediments, under various conditions.

Duration In progress, August 1973; requires eight months.

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory;
Chemistry II Section (Mercury)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section

MICROBIAL ECOLOGY OF ACID MINE DRAINAGE WATER AND ASSOCIATED MILL TAILINGS WASTES

Description The generation of acidity and dissolution of iron and other heavy metals in mine-mill tailings wastes is in part accomplished by iron and sulphur-oxidizing bacteria. Population levels of these autotrophic bacteria in various mining wastes and identification of the microbial species capable of producing H_2SO_4 from pyritic constituents of tailings will be surveyed. Effects of various mine-mill reagents on these species will be studied as well as other treatments in an attempt to inhibit their development on tailings wastes. Acids and heavy metals from the mining industry destroy most aquatic life and change species' development. A search for acid-tolerant or metal-tolerant micro-organisms in mine-polluted waters may be helpful in finding indicator species for this unique type of pollution.

Duration On-going

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory;
Bacteriology Section).

Supervision L. Vlassof, Supervisor, Bacteriology Section

MICROBIOLOGY OF ANAEROBIC TREATMENT PROCESS FOR CHEESE WASTES

Objective To assess the treatment process of dairy waste and follow any change in the bacterial process with a view to advising the Research Branch on better methods of treatment.

Duration Expected termination date: March, 1974

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory; Bacteriology Section).

Supervision L. Vlassof, Supervisor, Bacteriology Section

MONITORING MOVEMENT OF MERCURY IN THE FOOD CHAIN

Objective To analyze isopods, amphipods and fish to chart movements of mercury through the ecosystem.

Duration In progress, August, 1973 and requires four months. A new study will start in mid 1973 requiring a further twelve months.

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory:
Chemistry II Section (Mercury)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section

NITRIFICATION STUDIES

Description (1) Difficulties in waste water treatment at an Oakville Oil refinery are being encountered with high ammonia levels in effluent being a problem. Laboratory experiments with raw and treated waste water are being conducted in an attempt to overcome the suppression of nitrification by treatments which may be feasible to employ on the large scale, if successful on the small scale. (2) To determine the relationship between populations of nitrifying bacteria and ammonia oxidation, dissolved oxygen and BOD in Thames River surface water as it has been reported that in some instances where ammonia levels of river water are relatively high, BO sags may result from nitrification.

<u>Duration</u>	(1) Completion	<u>Site</u>	(1) Oakville
	anticipated, November 1973		(2) Thames River
	(2) Completion anticipated,		
	September 1973		

Commentary An in-house research project of the Laboratory Branch (Specific Budgetary Program - Laboratory & Research: Laboratory; Bacteriology Section)

Supervision L. Vlassof, Supervisor, Bacteriology Section

NORTHERN ONTARIO WATER RESOURCES STUDY

Objective To carry out a water quality study of the major river basins draining into Hudson Bay.

Duration Field work to be completed during 1973/74.

Commentary An in-house research project of the Laboratory Branch. (Specific Budgetary Program - Laboratory & Research: Laboratory; Chemistry I Section)

Report The final water quality report is expected to be complete during the fall of 1973.

Supervision C.E. Simpson, Supervisor, Chemistry I Section

PCB ANALYSIS IN FISH - ROUND ROBIN SAMPLING

Objective To examine, for PCB's in fish, the validity of various analytical techniques, and to obtain inter-laboratory comparisons of accuracy and precision.

Duration Current, August 1973; 3-year full duration

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory;
Chemistry II (Organic))

Supervision P.L.Diosady, Supervisor, Chemistry II Section

PHOSPHORUS ANALYSIS IN SEDIMENTS

Objective To develop a reliable method for measuring phosphorus in sediments which contain high iron concentrations.

Commentary An in-house project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory; Chemistry I Section)

Report A paper to be presented at the CIC-CCIW Conference, in November, 1973.

Supervision C.E. Simpson, Supervisor, Chemistry I Section

POLAROGRAPHIC ANALYSIS OF WATER SAMPLES TO MONITOR DETERGENT COMPONENTS,
INCLUDING NTA

Objective To develop polarographic methodology for the analysis of water samples for determination of detergent components including NTA. To permit monitoring of these components and study of their behaviour as potential environmental hazards, such as mobilization of heavy metals from sediments.

Duration Current, August, 1973, 1 month.

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory;
Chemistry II Section (Organic)).

Report In preparation

Supervision P. L. Diosady, Supervisor, Chemistry II Section

PRESERVATION AND ANALYSIS OF WATER SAMPLES FOR METHYL MERCURY AND FIELD METHODS
FOR MERCURY IN WATER

Objective To provide an in-depth survey of mercury in water.

Description Requires development of ion exchange, extraction or other preparative procedure for determination of methyl mercury in water. Requires improvement of sensitivity for total mercury and examination of published field methods. To determine the forms of mercury present in waters either of natural or industrial origin.

Duration Requires eighteen months; projected completion 1974/75.

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory;
Chemistry II Section (Mercury)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section

PRESERVATION OF FISH SAMPLES FOR MERCURY ANALYSIS

Objective To evaluate effects of preserving fish in alcohol-formalin solution. Methyl and total mercury will be determined. The analysis of contemporary fish for matching with museum species will also be completed.

Duration In progress, August 1973. Requires at least eight months.

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory;
Chemistry II Section (Mercury)).

Supervision P. L. Diosady, Supervisor, Chemistry II Section

QUALITATIVE STUDY OF BACTERIAL POPULATIONS OF AN UNDEVELOPED LAKE AND A
HEAVILY COTTAGED ONE

Objective To compare bacterial populations of a marsh and non-marsh area of an unpopulated lake and determine if there is a qualitative difference between these areas. To compare qualitatively, the bacterial population of a heavily cottaged lake to determine effects of any reclamation and cottage development on bacterial populations.

Duration Expected termination date: December, 1974

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory;
Bacteriology Section).

Supervision L. Vlassof, Supervisor, Bacteriology Section

QUALITY CONTROL OF PRESENCE-ABSENCE (P-A) TESTS

Objective To provide a method for checking results from the central and regional laboratories to maintain optimal isolation frequencies from P-A media.

Duration Expected termination date: December 1974

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory; Bacteriology Section).

Supervision L. Vlassof, Supervisor, Bacteriology Section

RATIO OF METHYL/TOTAL MERCURY IN FISH AND DISTRIBUTION OF MERCURY THROUGHOUT FISH

Objective To statistically evaluate the relationship between methyl mercury and total mercury in fish from industrial and non-industrial areas; to investigate levels of Hg in various organs, to relate location to organ ratios or methyl mercury/total mercury ratio.

Duration On-going to mid 1973.

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory and Research: Laboratory;
Chemistry II Section (Mercury)).

Report In preparation

Supervision P. L. Diosady, Supervisor, Chemistry II Section

Objective To prepare a report on chemical water quality of the lakes studied under this program, and to collect background data for pilot scale studies of holding tank use.

Duration Ongoing

Commentary An in-house project of the Laboratory Branch, in conjunction with the Water Quality Branch program. (Specific Budgetary Program - Laboratory & Research: Laboratory; Chemistry I Section)

Supervision C.E. Simpson, Supervisor, Chemistry I Section

SEPTIC LEACHATE DETECTION

Description Bacteriological procedures to detect septic tank leachate on recreational lakes with cottage development.

Duration Ongoing function

Commentary In-house applied research of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory; Bacteriology Section)

Supervision L. Vlassof, Supervisor, Bacteriology Section

SILICA ANALYSIS

Objective To review present method and to devise an automated procedure.

Duration New method to be in use by January 1, 1974

Commentary An in-house project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory;
Chemistry I Section)

Supervision C. E. Simpson, Supervisor, Chemistry I Section

SODIUM AND POTASSIUM ANALYSIS - ALTERNATIVE TO THE FLAME PHOTOMETER

Objective To develop a more accurate alternative to the flame photometer, using the emission mode on an Atomic Absorption unit.

Duration New method should be in use by January, 1974.

Commentary An in-house project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory;
Chemistry I Section)

Supervision C.E. Simpson, Supervisor, Chemistry I Section

SODIUM AND POTASSIUM ANALYSIS IN SLUDGES AND PLANT MATERIAL

Objective To develop a method for sodium and potassium analysis in these two media.

Duration Work complete as of August, 1973.

Commentary An in-house research project of the Laboratory Branch.
(Specific Budgetary Program - Laboratory & Research: Laboratory;
Chemistry I Section)

Report Completed September, 1973

Supervision C.E. Simpson, Supervisor, Chemistry I Section

SUDBURY ACID MINE WASTE STUDY

Objective To improve methods of analysis of pH and low level ionic components and to provide on-site analysis for the proposed reclamation studies.

Duration Ongoing

Commentary An in-house research project of the Laboratory Branch, complementary to the fullscale environmental assessment of this region by the Water Quality Branch. (Specific Budgetary Program - Laboratory & Research: Laboratory; Chemistry I Section)

Supervision C.E. Simpson, Supervisor, Chemistry I Section

TOTAL CARBON

Objective To evaluate the use of the total carbon analyser with a view to improvements and/or replacement.

Duration Commenced - September, 1973; anticipated completion - January, 1974.

Commentary An in-house research project of the Laboratory Branch (Specific Budgetary Program - Laboratory & Research: Laboratory; Chemistry I)

Supervision C. E. Simpson, Supervisor, Chemistry I Section

USE OF INDICATOR BACTERIA FOR NON-FECAL TYPES OF POLLUTION

Objective To develop the use of indicator bacteria other than the standard sanitary parameters (coliform, fecal coliform, fecal streptococcus) which may be of use in evaluating non-fecal types of pollution.

Duration Expected termination date - March, 1974

Commentary An in-house project of the Laboratory Branch (Specific Budgetary Program - Laboratory & Research: Laboratory; Bacteriology)

Supervision L. Vlassof, Supervisor, Bacteriology Section

X-RAY FLUORESCENCE IN VEGETATION ANALYSIS

<u>Objective</u>	To determine which elements can be analyzed by the X-Ray fluorescence method.	
<u>Description</u>	Part I	Analysis of sulphur, chlorine, phosphorus
	Part II	Analysis of lead, bromine, arsenic, silicon, etc.
<u>Duration</u>	Part I	April 1972 to March 1973
	Part II	April 1973 to March 1974
<u>Commentary</u>	An in-house research project of the Air Quality Laboratory. (Specific Budgetary Program - Laboratory and Research: Air Quality Laboratory; Physical Methods Section).	
<u>Budget</u>	\$9,000 (salaries); \$7,000 (capital)	
<u>Report</u>	Part I	Completed July 1973. Report in preparation
	Part II	Interim Report in preparation
<u>Supervision</u>	Dr. J. A. Pimenta, Project Leader A. C. Rayner, Chief, Air Quality Laboratory	

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